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American Machinist

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Machine Tool Design
and the New Cutting Alloys

IF SOME of the more conservative machinery building industries were suddenly faced with the introduction of a factor as unsettling as the new tungsten carbide and other cutting alloys promise to be one would be justified in looking for a catastrophe. But the machine tool builders have been earning their livelihood so long by bringing out new designs and selling them to customers whose equipment was still far from worn out that the existing situation can be faced with considerable equanimity. There can be little question but that the new alloys are going to have a profound effect once we can get them in sufficient quantities to conduct experiments to see what they really will do. Much of the present uncertainty is caused by the fact that machines do not exist that will test them to the limit. Under these two handicaps it is small wonder that everybody is more or less marking time and wondering what will happen next. Most of the tests so far conducted, of which we have any public record are either laboratory tests or what might fairly be called "stunts." It is extremely impressive to see a machine tool turning up glass, or porcelain, but the results do not give the machine tool designer or the production man who wants to improve the efficiency of his own department very much definite data to build upon. On the contrary, a test made on a bronze forging brought in by a visitor at one of the trade shows where the new alloys were being demonstrated gave the observers food for thought. The visitor had been able to turn the bronze of this forging at a maximum rate of 15 ft. per min. The tungsten carbide tool started at this speed and was run up to 480 ft. per min. The feed, of course, was fine, less than $\frac{1}{16}$ in., but the depth of cut had a maximum of perhaps $\frac{3}{8}$ in., varying by reason of the rough contour of the forging.

The statement has been made that the new alloys are not suited for heavy, hogging cuts because of the brittleness of the material. Perhaps this is a fair statement of the case today but there is every reason to believe that further research will find some way of adding toughness to the alloy and thereby making it more resistant to shock.

This very lack of toughness and susceptibility to failure in case any chatter exists indicates the need for the design of tool holders that will be considerably more solid than the ones in common use today. Quite possibly some of the extra strong holders designed for special high-production machines will answer the purpose. Another unit of the machine tool that will require attention is the tail center. Under heavy pressures, and at the abnormally high speeds at which the new alloys work the generation of heat at the tail center is a serious matter. Artificial cooling or some sort of anti-friction bearing application will probably have to be resorted to in order to permit operation at economical speeds. The life between grindings of tools made of the new alloys is so far ahead of anything we know today, under cutting conditions at all approximating what they promise to do, that more elaborate tool set-ups will prove economical. It seems likely that production methods are more likely to be affected by this factor than the machine tools themselves.

So much excitement has been caused by the demonstrations of the new tungsten carbide cutting alloys and certain other cutting materials that the editors of the *American Machinist* have canvassed the situation. They hope that their findings will be criticised constructively

Tool dressing is going to be an operation far different from what still goes on in the average shop. If a machinist undertakes to dress a tungsten carbide tool on the nearest grinding stand he is going to find that the wheel will be the part whose shape is changed, and not the tool. Special wheels have been developed that will cut the new alloys but they should be kept in the toolroom or tool dressing department. It may sound foolish to make such a statement here because in the best plants tool dressing is entirely centralized. Unfortunately, however, the practice is far from universal, and therefore the introduction of tools that cannot be dressed in the traditional manner

may go far to improve the practice of the more backward shops.

This mention of the difficulty of dressing the new alloys leads naturally to a word on their ability to cut abrasive non-metallic substance, such as fiber and phenol resin compounds, which are fatal to steel tools. Experience in cutting these materials indicates that the life of the tool is practically unlimited at the speeds available. Such being the case, special machines of considerably higher speed must be developed for cutting these materials. It may well be that the type of direct motor drive used in modern woodworking machines can be adapted for the purpose. It may even be possible to equip the woodworking machines with tools made of the new alloys and use them without other important modification.

Perhaps the introduction of the tungsten carbide tools will be the one thing needed to swing the machine tool builders over to a use of steel castings or welded steel shapes for machine bases in order to secure the extra rigidity needed without the excessive weight that would be needed if cast iron were to be retained. It should not be forgotten that, weight for weight, steel is far more rigid than cast iron. Much better steel castings are now available than could be had only a few years ago, and the technique of welding has also advanced enormously.

At the same time, the greater strains to be expected on other machine tool parts point to the use of more alloy steels in shafts, gears, and other moving parts. Much progress in this particular has already been made but the end is not yet, by any means.

Loading Time Must Be Reduced

Another point that is going to need attention is loading time. If the actual cutting is to be done at a much faster rate the proportion of the cycle of operation required for loading and unloading is going to be increased very much. Consequently anything that can be done to cut down the actual number of minutes or seconds required for loading and unloading is going to be of more importance than used to be the case.

But how imminent are all those revolutionary changes? In view of the fact that only very limited quantities of the new alloys are available, hardly enough for the most elementary of tests, it seems reasonable to believe that nothing will happen right away.

Even the most radical of designers must have something more definite in the way of performance data on which to base his designs than has been forthcoming so far. Undoubtedly we shall see the first applications of the alloys to operations in the automobile shops. The production men there are under extreme competitive pressure and will insist on getting the latest and best, sometimes regardless of cost.

Cost as Yet Unknown

As a practical consideration, however, it must be remarked that no one knows, as yet, just what the new alloys are going to cost. It is also uncertain just how even the simplest tools are to be made up. Copper brazing of small bits to nickel steel shanks seems to have the call just now, but is open to question because of the high temperatures at which the tools can be made to operate.

Then, too, there are very many operations, even in the most efficient shops where nothing would be gained by introducing the new tools, or where the operating conditions are not suitable.

And, finally, there is the very important consideration that only a highly organized production force can get the full value out of such a speeding up as might result. After all, the actual cutting is a small part of the production problem. There is material to be supplied, finished work to be taken away, and chips to be disposed of. Personnel problems, organization problems, maintenance of equipment problems—all of them enter into the picture and unless the whole functions smoothly it is impossible to reap the real benefits of a radically new departure like this one.

Changes are coming, unquestionably, but not so quickly as to upset the metal working industry. It is to be hoped that some way can be found of pooling the research work that must be done, and thus to avoid the expensive duplication of effort that must come otherwise. Watchful waiting is perhaps the policy to adopt now, but it must be followed by active development as soon as the missing information on which to build becomes available.

Why the Government in Pensions? *Discussion*

By D. B. Wedge

THERE is to my mind only one reason for the Government, Federal or State, to have a finger in pensions, as asked by your editorial on page 898, Vol. 69. If pensions are to become universal, and you mention that over 4,000,000 workers were covered by some form of pension in 1927, it seems as though they must be at least guaranteed by some central body. For even the best and oldest of firms get into financial difficulties at times, and their failure leaves their dependent pensioners sadly in the lurch.

It would seem that this could be easily avoided by treating the pension problem in much the same way as we do accident compensation in some states. Every firm could pay an insurance premium to a central fund, controlled either by the state or by a designated group of insurance companies, the premiums being in proportion to the number of employees. Pensions would be paid from this fund, so that the failure of one company would not beggar any group of old employees. I agree heartily that the pension fund should not come from taxation but from industry, but does it not seem necessary to have its operation controlled by some central body?

Preparation for Aluminum Welding

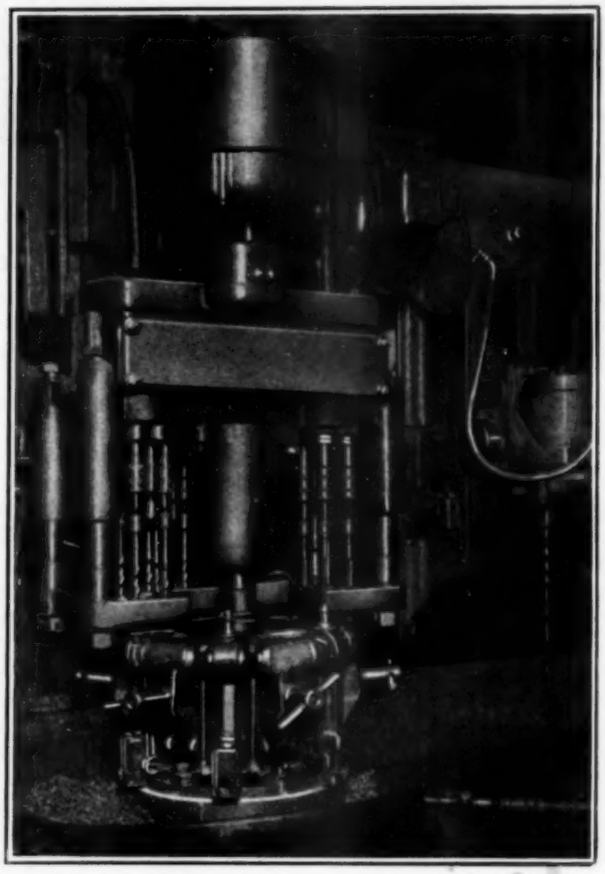
By A. Eyles

IN PREPARING broken or cracked aluminum castings for repair by autogenous welding, it is not only necessary to make sure that the surfaces to be welded are scrupulously clean, but also that the areas near the welds are equally clean. Otherwise, the impurities near the joint invariably start disintegration, and ultimately the weld will fail. Various methods for cleaning aluminum castings are in use—scratch brushing, sandblasting, washing with gasoline, kerosene, or benzine, or immersion in caustic soda solutions for a few seconds and then washing in clean hot water. In some instances it is desirable to heat the castings slowly until the oily matter contained in the pores of the casting has been expelled. Should welding be done on oily castings that have not been thoroughly cleaned, the oil carbonizes and adheres to the edges of the metal, thus making a good aluminum weld impossible.

Production
With Standardized Units

By Herbert E. Taylor
M.I. Mech. E., M.I.A.E.

HAVE those of us who are responsible for production about reached the limit in reducing costs and increasing output? Or have we become so accustomed to the present practice of using standard machine tools, single-purpose tools, or a grouping of the two that we must be shaken out of our rut by some idea bordering on the revolutionary? What I have to propose may not be revolutionary but I am sure it is a step beyond what most shops are doing now, and probably outside the bounds of what some engineers would consider reasonable. It is called the "unit continuous system of manufacture." It contemplates the assembling of standardized production units such as drilling, milling or bordering heads on a frame or base in such a way that all of the operations on a part—a gearcase, a piston or a connecting rod, for instance—would be completed by the time it had reached the discharge end of the machine. The thought is not new. It was presented to English engineers in a technical society paper some years ago, a paper that was ahead of its time if one may judge by its effect on current practice. In England one installation of the system has been made, more or less experimental in nature because of the novelty of the idea, and with corresponding imperfections. I understand that somewhat similar efforts have been made in certain plants in the United States and that some of them are in successful operation. One of the advantages of the system is that it can be adopted gradually, a step at a time, if traditional human conservatism resists swallowing the entire plan at one gulp. I am inclined to favor this method of adoption, myself, because of my experience with this conservatism.



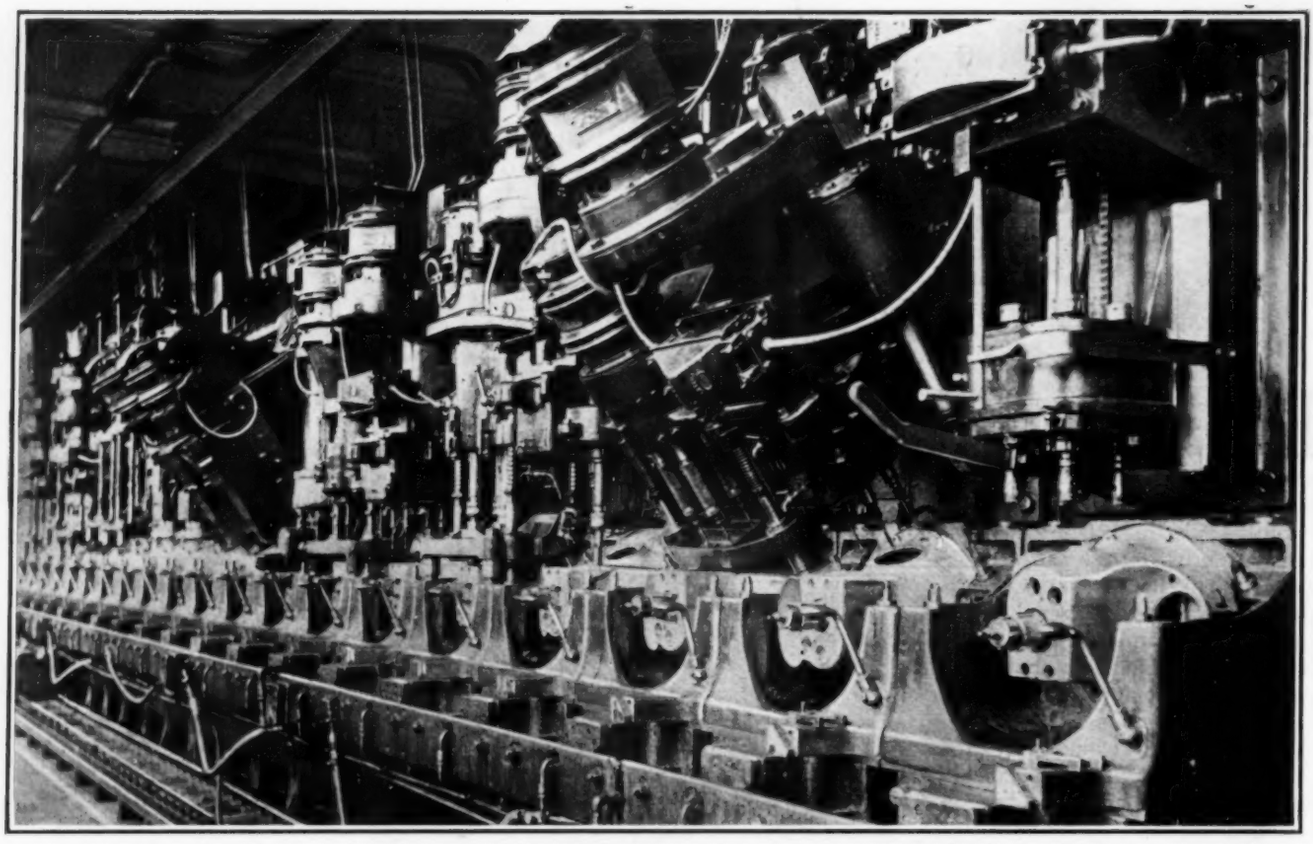
One of the units in the connecting rod line. It is a combination of the line and station principles, for the rods are carried on fixtures mounted on an automatically indexing station table and are passed along by hand to other station tables mounted in line

The system has three steps or stages, of which the first is the development of the simple machine unit operated by push-button control.

The second step is the application of automatic unit control for the timing and operating of the simple machine units of the first stage.

The third and final stage is the installation of an automatic work moving unit to replace the manual handling incident to the operation of the first stage, or the first and second stages together, without it. Obviously, the first difficulty encountered in attempting to realize such a scheme as this one is in getting the standardized machine units with push-button control as required for the first stage. Until a number of possible users of such units have come to the point where they are ready to place considerable orders the cost of the units will be too high for one to accomplish the full results possible in production cost reduction. So long as the units must be built as specials by the machine tool people their cost is going to be correspondingly high. Not very much progress in this direction can be recorded although one American machine tool builder is making a standardized electric motor drive unit that can be built into any machine within its range. These units are being used in several sizes and models of his own product, and are also being sold to other machinery builders. The vision I have is of a time when there will be such a demand for these standardized units that the builders themselves will use them in their own shops and the cost will be thereby greatly reduced. When that time comes the danger of serious loss of time from the failure of a single unit in a production machine combining many units will be eliminated, because the toolroom will carry spare units just as the repair department now carries spare electric motors, or an aviation repair shop carries spare airplane motors that can be slipped into a plane in a few minutes.

It would be silly to expect that the manufacture of one type of unit, say a drilling unit, would be confined to one company. Several companies would undoubtedly



A section of a gearbox machine designed to operate on the Unit Continuous System. Several different styles of units or heads are shown. The gearboxes are in position in the production line in standard fixtures that permit of indexing and rotation to meet the needs at the various stations along the line

make it and each would have its various "talking points." But all should be interchangeable so far as their attachment fittings were concerned. Only a very short time ago such sane standardization in a machine tool unit would have been purely visionary, but the recent action of American milling machine manufacturers in adopting a standard spindle nose so that their customers no longer have to carry a complete set of cutters for each machine is a hopeful sign that the times are changing.

In the design of the units or heads we can go a step beyond the commendable present practice of building the driving motor into the machine frame. Why not discard the motor frame and build the motor as part of the unit? The thing has been done in wood working machines. Speeds can be higher there, of course, because of the material to be cut, but it is entirely possible to build in whatever reduction gearing may be necessary when harder materials must be dealt with.

Push-button control is common practice on machines far more complex than the simple units or heads I have in view and it therefore presents no particular difficulties. Its application reduces the energy expended by the operator and permits him to attend more than one machine or unit. His daily production is correspondingly increased.

This is the first stage, in which the operator is relieved of certain manual machine control motions but is still responsible for starting and stopping his unit, or units, and must also push the finished piece along a slide or roller conveyor to the next unit.

The next stage is reached when the control of all the units involved in a given installation is centralized. Nothing is left for the operator to do but to load and unload his units at the proper time and move the finished pieces along to the next station. This stage has been reached in a few station-type machines, but in them it covers only a comparatively small group of operations. My idea is that it should be extended to cover all the operations on a relatively complicated part. And there is no question but that it will be so extended in the near future.

To achieve the full economies possible through the use of the unit system of manufacturing the manual transfer of work must be replaced by mechanical conveyors. When this has been done we have arrived at the third stage. Until further experience has been had with the third stage it should probably be considered as the final one, although many refinements of the first experimental installations are possible, and a further development should be considered as an ultimate objective.

The complete third stage contemplates the assembly on a single base of the required number of standardized production units or heads, each one controlled by the central control mechanism and thereby synchronized with all the others. A central lubrication system oils every part of the whole mechanism mechanically and positively. Gaging or inspection of the work is performed mechanically and automatically at as many stations as is required. Coolant is supplied at the points needed by a central circulating pump, and chips are carried away by a separate conveyor. The parts are moved from station to station by a conveyor or a swinging arm or whatever mechanism best meets the particular needs.

As remarked before, one such installation, admittedly experimental and consequently somewhat crude in spots, is in operation in England, and I am told that there is at least one installation in the United States that works on much the same principle. There may well be others

along the same lines with which I am not familiar. The system, therefore, is entirely feasible.

Is it sufficiently flexible? The answer to that question depends largely on how well standardized the units are, and on how adaptable to parts of various shapes the transfer mechanism is. This much is probably safe to say, that if the details mentioned have been perfected it will be easier to modify it for a new piece of work than to rearrange and re-tool an installation of standard, or standard and single-purpose, machine tools adequate to handle the same job.

I am in hopes that machine tool designers and production men will take this suggestion of mine seriously enough to comment on it and to criticize it as frankly as may be. It is my earnest belief that the system holds great possibilities for the saving of labor and the reduction of production costs. But the full realization of the potentialities of the plan cannot be attained until many more men have given it careful thought and experimented with it. I am sure that such thought and experimentation will generate an enthusiasm that will carry it through to success.

Does In-growing Development Work Pay?

By P. H. Bryant

A MANUFACTURER was confronted with a new and perplexing problem in thread tapping. The material, by specification not under his control, had to be of an analysis and temper that offered the greatest difficulties to the generation of a smooth thread. To add to these difficulties, the parts to be tapped were in the form of thin-walled rings produced by rolling a length of flat stock into cylindrical form and welding the joint. These welds were full of gas pockets and hard spots, causing breakage and abrasion of the chasers starting from the first passage of the tools.

The company had purchased, for the purpose, a tapping equipment of standard make, the specialist furnishing the tools not being informed at the time of purchase of the peculiar characteristics of the material on which the tools were to be used. As soon as it was discovered that the tapping equipment, as furnished, would not produce a satisfactory thread, the manufacturer wired the tap maker to send on an expert.

The expert, unable to get better results himself, wired in his turn for an official of his company, a man of extensive practical experience. This man made further tests trying out various modifications of the grinding of the chasers, but failed to produce a thread that was acceptable.

A conference was called, and the threading specialist stated his case substantially as follows: "The problem you have offered is a step beyond any that we have met and solved to date. At the moment we are baffled but know that we can solve it if given a little time and your full co-operation. We beg this time and co-operation because we believe it the most economical procedure for you, and further, because having gone this far, it is a matter of pride with us not to drop out until the solution is found."

But the manufacturer was adverse to extending the co-operation asked for. His reply was: "In selecting your tapping equipment we assumed that it represented all that was essential to do our work satisfactorily. We find that it does not, and that you must acquire further special experience. You are proposing to get that experience in our plant and largely at our expense, and after it has been gotten we can turn around and buy it over again from you at so much per unit. At the same time, our competitors can buy it from you at exactly the same price. If we must invest in pioneer research work to master this problem, we will do the whole job ourselves and insure the benefits to ourselves."

The tap specialist dropped out of the picture and the manufacturer proceeded with the design of a special tapping head and thread chaser according to the ideas of the designer he was able to hire for that specific purpose. In somewhat less than a year, production of a satisfactory product was established, patent applications covering the equipment were on file, and within the organization the development was rated as successful and satisfactory.

I was in a position to observe every phase of this development from start to finish, and many times during that period, and afterward, have engaged in mental argument as to whether, after all, it was a paying investment or a wise policy.

To begin with, the best experience that the manufacturer was able to bring to bear on the problem was that of a clever general mechanic and designer. Naturally, he could not acquire specialized experience in tap design and manufacture, because that was centered in the specialized industries.

The first phase, therefore, of this investment went into educational work, starting back at a point the tap specialist had probably passed many years before. Assuming that this educational work was thorough and the pupil apt, it must be agreed that at no stage of the development could any such degree of trained ability and experience be brought to bear on the problem as the tap specialist would have possessed at the outset if he had been allowed to proceed.

To go a step farther, isn't there considerable fallacy in the reasoning that assumed to insure to the manufacturer alone, the benefits of his research work, because he has barred the tap specialist from further contact with his plant and problems?

The inventive mind needs only the stimulus of suggestion to set its teeth into a baffling problem and never let go until it is solved. The manufacturer has already supplied the necessary stimulus and, with ordinary business acumen, should have known, that the tap expert would not be diverted by any shut-out policy from going forward independently to a solution.

As a matter of fact, that is exactly what happened, and months before the manufacturer had arrived at a production basis, the specialist was offering competitors satisfactory tools for the selfsame purpose.

Approximately 600 airplanes a month are being built in this country, in addition to engines, instruments and other accessories for them. Applications for licenses as pilots and mechanics are reported to be three times as great as last year. Regulations covering "stunt" and low flying over congested areas, flying without a pilot's license, and other unsafe practices are being enforced, and there are other evidences that aviation has arrived.

The "Can't-Be-Done" Man

THE Baker Machinery Company was preparing to segregate part of its output in another plant. The big boss had selected a likely young general foreman from the old plant to take charge of the new one. But he was a bit worried when the new man picked the crew of assistants he wanted for the new plant. So the big boss, Frank Baker himself, asked Bill Holland, our counsellor-at-large, to talk the plan over with Jim Baxter, the superintendent of the new plant.

"It's this way, Mr. Holland," said Baker. "I picked Jim for the job because he is young, energetic, and has a lot of good ideas about running a plant. I gave him a chance to pick some of our men to help him, and I fear he hasn't picked the best men."

"I've picked the men I believe can help me build up the new plant, Mr. Baker," said Jim.

"Of course, Jim, but I think you're wrong in picking so many young men, or at least those without very much experience on that work.

"Why didn't you take Hitchcock for your right bower, Jim. He's a mighty good man, and I'd feel a lot safer if you had a man with his experience on that job with you. He's been with us a long time, you know, Jim."

"I hate to seem to cross your judgment, Mr. Baker," replied Jim. "Hitchcock is a good man and I like him personally. But it's my belief he's had too much experience in the wrong way of doing things."

"Then you don't think our way is right, Jim?" and Baker began to get hot under the collar.

"Frankly I don't, Mr. Baker. And if you had felt quite sure of it, I don't believe you'd have moved the work out of the old shop."

"Well, what do you think of that, Mr. Holland? And you seem to be trying to hide a smile, too. What is there funny about it?" Baker was still a bit fussed.

"I'm amused, Baker, because I've just seen a similar case. It may interest you.

"This case was almost identical, and strange to say, the new super did just what Mr. Baxter wants to do—picked men without too much experience in the old shop. As he put it to me, 'he didn't want men who had so much experience that they knew it couldn't be done.' He had been balked several times in the old shop when he wanted to try a new method by older men in the plant who 'just knew his plan couldn't work.' "

"Seems like a bit of egotism to me, Mr. Holland," said Baker, "for a young man to reject the experience of older men."

"It probably is, Baker. But it was the same kind of egotism that urged the Wright brothers to fly, and a host of others to do things that older and more experienced men said couldn't be done."

"But this seems different. Anyhow, I'd like to know how the case you mention came out."

"Oh, it came out all right," replied Holland. "The young super made a new shop layout, introduced new methods that were doomed to failure because they wouldn't work, according to the prophets in the old plant, and otherwise showed a lot of nerve and egotism. The new plan worked so well that the old shop is getting ready to discard the old methods and adopt the new."

"Doesn't experience count at all then, Mr. Holland?" demanded Baker.

"Of course it does, Baker. But when experience becomes so much of a habit that you get the notion you have all the real ideas sewed up in your own cranium, it's a handicap. There's nothing more dangerous to progress than the 'can't-be-done' man."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

EXECUTIVE FORUM

Discussion

Paying for Advice

It is human nature not to appreciate anything obtained gratis, and valuable advice is often placed in the category of things received for nothing. This is the case when valuable advice given by one machine shop contractor to a prospective purchaser is used by him in placing his order elsewhere.

I believe situations of this nature need to be remedied. Perhaps the best solution would be for the mechanic to capitalize his knowledge and make a charge for giving valuable advice.

Listed under the heading of "service" are quite a large number of items. But it is hardly fair to always expect the mechanic to give valuable advice relative to specified machines to prospective buyers as an item of service.

It is easy to abuse a privilege extended as a means of securing business. The fact that the mechanic has given the buyer the impression that advice will always be given freely makes the request for payment rather difficult. The situation needs to be handled tactfully, otherwise business may be difficult to obtain. A habit is not easily broken. The mechanic who has formed the habit of giving advice to his customers and has led them to the conclusion that his advice is a part of service requirements, should present his plea for payment diplomatically.

Perhaps the best method would be for the mechanic to charge a retaining fee, the amount of which will depend upon the size of the order, and which will be considered part payment on the order if the buyer makes the purchase from him. If the order is placed elsewhere the fee will be retained in payment for the advice given. In this manner, the mechanic will receive a part return for his expenditure of helpful knowledge.

—N. Burd.

Planning the Plant Layout

The problem of plant layout is a serious one to contend with, for if the correct methods of procedure are not followed, considerable losses are sure to ensue at a latter date, due to the revamping of departments or to the improper routing of materials.

At the present time our company is constructing an additional number of modern buildings, which require an entire new lot of equipment. The work of planning the departments falls upon the factory planning department, whose engineers are pursuing the following methods.

The drafting department makes up large tracings for each floor throughout the new buildings, showing an outline of the walls, courtways, entrances, building columns, and service piping, so that all possible interference can be readily seen. Blueprints are made from these tracings, and are tacked on large drawing boards. Templates are made of each individual piece of equipment which is to be installed. Each template includes sufficient space for material storage, and working space for the workman. Upon completion of the preliminary work, the engineer calls into consultation the superintendent, department head, and others who may be interested, and discusses with them the advantages and disadvantages of the arranged layout.

—Fred Aug. Schmidt.

Paying for Special Designs

At the time this story was told it would seem that French was entirely within his rights in asking for a fair price for his design. There was a time, however, when French might have protected himself. At the time Brown asked for plans and estimates of a special machine which he was evidently not in a position to design or build, French should have stipulated in his specifications that if his plans were accepted he should build the machine. If the design and building were separate jobs, then he should have set a price upon his design with a further price for any detailing required by Brown.

While business ethics are improving, they have not yet arrived at a state that makes it safe to depart too far from business practices that can be upheld by law if necessary.

—John Mark May.

When the Rush Comes

It will not be a good plan to double the force in order to get the work out on the date specified. In the first place, it will take too much time and effort to get the increased force into working shape, to make the plan profitable to the builder. Secondly, the class of machines to be built require expert workers and it is only too true that such men are scarce. Therefore, endeavoring to build up a force of good men in a short time is a well-nigh impossible task.

Even if the builder is fortunate in getting the high class of help needed for the job, it will take considerable time to get them accustomed to just what class of fits the builder has to have on different parts. Breaking in new men consumes a great deal of time.

The best plan, in order to get the job done on time, will be to speed up the regular production and endeavor to work in all the extra men possible, without upsetting the men already on the job.

—Sidney Taiz.

The New Beam-Sections in Welded Machine Bases

Photographs by courtesy of the Carnegie Steel Company

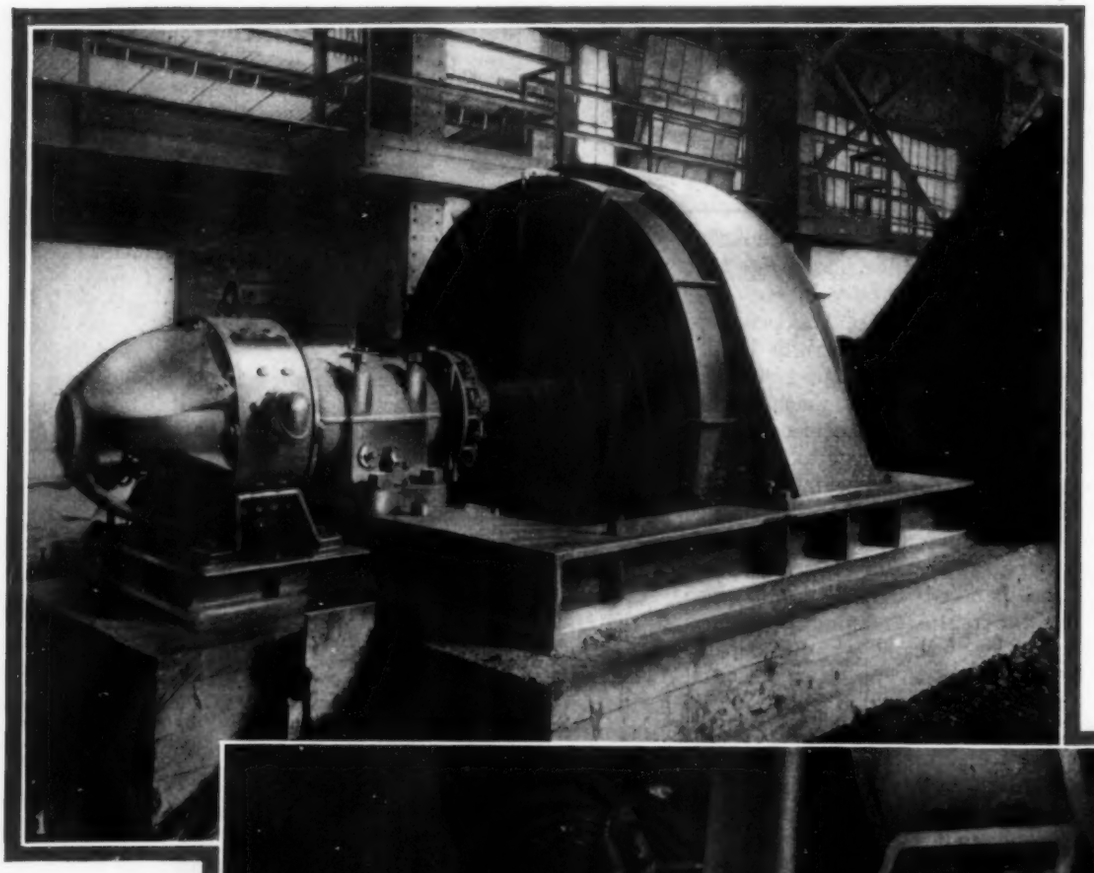


Fig. 1—Use of the new beam-sections in the bed plate of a 4,000-hp. motor. The elimination of internal flange slope in these beam-sections gives the welder eight non-sloping surfaces for connections, instead of four as in the old sections

Fig. 2—Part of the bedplate for a 1,500-kw. generator set. The uniform flange thickness facilitates welding, and gives a neater job because the flanges in contact always have the same thickness

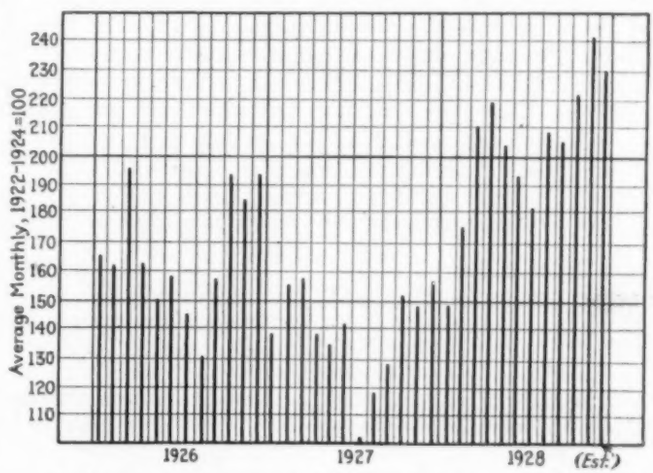
After a Record Year

Industry Faces 1929 Confidently

By Robert M. Davis

Statistical Editor, McGraw-Hill Publishing Company

ON THE basis of the consumption of electrical energy for industrial power purposes during the year just closed, the country has passed through the greatest productive activity in its history. The average rate of production during 1928 for general industry was about 7 per cent over that of 1927 and 9 per cent over that of 1926. The year closed with a rate of activity in December about 17 per cent over the activity noted during December last year. This highly favorable condition, however, has not been common to all the industrial groups. While in the automobile manufacturing industry the average rate of operations was about 30 per cent over the rate in 1927, the metals industry and the rubber products industry, both 17 per cent, and the chemical industry 20 per cent, on the other hand, the average rate of 1928 operations in the lumber industry was about 11 per cent under those of 1927, and the textile industry for the year as a whole operated on a plane about 8 per cent under 1927. It must be added, however, that the year closed with textile plants in the country as a whole operating on a plane about equal to that of December, 1927, leaving the lumber industry, and possibly the leather industry, as the only two industrial groups operating under the previous year's activity.



Machine tool shipments in 1928 reached a remarkable level

Data for the past year also shows that New England general industry, in spite of the slump in textile operations during the first three-quarters of the year, has been operating, on an average, on about the same plane as during 1927, and some 5 per cent above 1926. Manufacturing plants of the Middle Atlantic Section have increased operations about 14 per cent over 1927. For the North Central States an unprecedented increase of 15 per cent is noted, and for the Western States an increase of 5 per cent over 1927 figures. On the other hand, the data on electric power consumption shows that the manufacturing plants in the Southern States have not maintained the large annual growth recorded since the War, but have actually been operating on a plane some 2 per cent under that of the previous year.

Outlook of Industrial Groups

Machinery and Machine Equipment

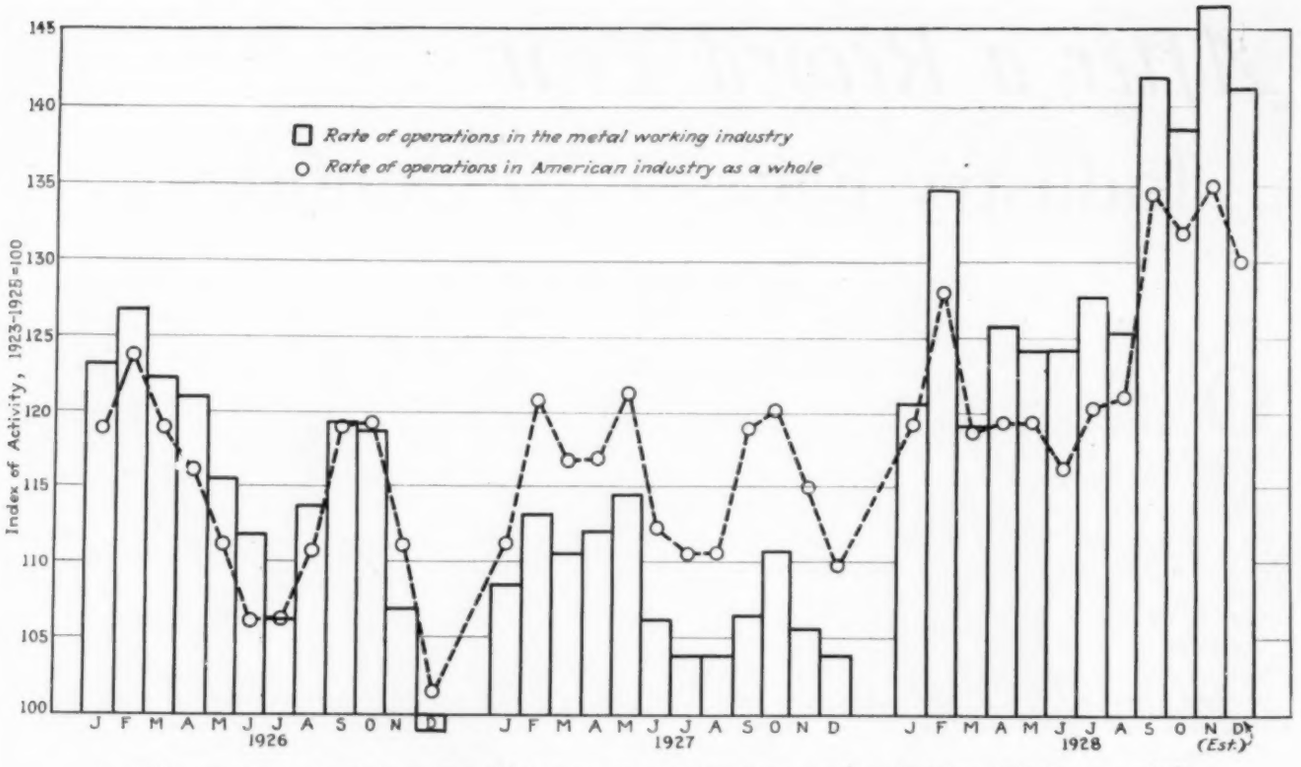
The machine tool industry has passed through the greatest year of its history, some manufacturers reporting that the demand even exceeded that of the war period. Shipments of machine tools averaged around 50 per cent over those reported for 1927. Orders booked by the industry in October were the largest of any month since March, 1920, and were 113 per cent greater than those booked in October, 1927. A study of the operations of this industry in past years would indicate that orders would normally be expected to decline during the fall months, but during 1928 a contrary trend was established with an October gain of 7 per cent over September. Although in November there was a recession in orders, due chiefly to a seasonal decline in operations in the automobile industry, the aggregate has held at a level substantially ahead of the corresponding monthly total for 1927. Even in the automobile trade, demand continues above normal; the farm implement, electrical and general metal-working industries are buying actively, and the requirements of the aviation industry are expanding steadily. The indications are that most machine tool producers will continue to operate at near capacity rates, at least in the early part of 1929. With general profit trends satisfactory and the near term outlook bright, the excellent earnings achieved during 1928 also should be repeated during at least the first quarter of this year.

Agricultural Implements

With large aggregate returns in most agricultural regions assured from the 1928 crops, the agricultural implement manufacturers should remain among the most prosperous in the country this year.

Automobiles

During the year just closed, operations in the automobile manufacturing industry as a whole were on a plane about 25 per cent above that of last year, and the outlook for the new year is most promising. So far as the first six months are concerned, the automobile industry's 1929 prospect is very promising. Stimulated by the introduction of new models, business will probably reach a higher level than in the first half of any preceding year. The parts and accessories branch of the automobile industry also has been operating on a higher plane during 1928. With automobile production promising to hold in unusually heavy volume during the early



In 1928 operations of metal-working plants were on a higher plane than for American industry as a whole

months of 1929, at least, the demand for parts and accessories should continue active during the early part of the new year.

General Construction

The construction industry closed the year on the highest plane in its history, with the accumulated volume of contracts awarded during 1928 some 16 per cent over the number awarded in 1927. It is apparent that, barring an unexpected credit strain, no real let-up in building and general construction activity will be experienced in the near future.

Chemical Industry

The year just closed was a banner one for the chemical industry as a whole. The new year will open with plants booked heavily for first-quarter delivery and with most of the larger concerns carrying sufficient business on their books to insure against any real let-down through the entire spring production period.

Electrical Machinery Industry

With the prospect that business activity will be maintained at a high level during the near term and with the recently announced electrification program of several railroads in view, the outlook for the electrical machinery industry, both for the near term and for the more distant future, is very favorable. For the industry as a whole the total 1928 earnings are likely to register a gain of at least 8 per cent as compared with 1927 earnings.

Paper and Pulp

The paper and pulp industry appears to be in a bad position. Reflecting an over-extended producing capacity which has precipitated a wave of competitive bidding for 1929 contracts, newsprint prices have been forced down to the lowest levels since 1916. Since the general paper field is already harassed by over-production, keen competition, and narrow profit margins, any attempt by the newsprint paper manufacturers to enter the general paper field would result in even further price cutting.

Railroad Equipment

Despite current betterment, conditions in the car-building industry during 1928 have been the worst since 1883 and it is a certainty that 1928 earnings of a great majority of equipment companies will be decidedly unsatisfactory. Recent improvements in railroad earnings, however, indicate brighter prospects this year.

Iron and Steel

Rolling mills and steel plants, as a whole, operated during 1928 on a plane about 12 per cent above that of 1927. With the mills already comparatively well booked for 1929 delivery, announcement of price advances in bars, shapes and plates are expected in the near future. Requirements of the automobile and building industries should increase during the first quarter of 1929, while continued improvement in natural gas and oil trade needs is indicated. One of the few lines for which any definite recession in requirements is now indicated is that of steel rails. In the aggregate, however, iron and steel output during the first quarter should compare favorably with, if not exceed the large output in first quarter of 1928, while prices should be higher, offering assurance of generally adequate earnings.

Favorable Economic Factors on Horizon

Many factors presage that whatever the course of manufacturing operations during the year 1929 as a whole, we are almost certain to witness manufacturing activity of abnormal proportions in the first quarter of the year. There are five favorable factors underlying the industrial outlook as the new year opens. First is the election of Mr. Hoover. The election still maintains first place as a favorable factor in the thinking of Amer-

ican executives, being important chiefly from the standpoint that the administration will be unchanged for the next four years. The executives of manufacturing corporations can now make their plans with certainty, in that they can see a continued prosperity inevitable with an economist and business leader in the White House.

Secondly, a general optimism and confidence in the future prevails through American industry. At the center of this confidence is Mr. Hoover. The forthcoming administration promises to be essentially sound from a business standpoint. The mental state of the nation alone gives to all business a hope and an optimism which foretells advancement and prosperity.

A third favorable factor contributing indirectly to a continuance of present high manufacturing operations, is the decrease in unemployment and a continued upward trend in wages with the cost of living remaining about stationary, resulting in a widely distributed and increasing consumer purchasing power. The mere fact that record manufacturing activity is prevalent does not within itself reflect prosperity or even a sound economic condition. That the record manufacturing operations of the past year have been balanced by a ready demand by the consumer, however, is indicated by the latest data issued by the National Industrial Conference Board. The present purchasing power of the nation as a whole in deflated dollars, or real purchasing power, is 55 per cent over that of 1909 and in current dollars is 173 per cent. The increase in real purchasing power per capita is 20 per cent over that of 1909 and that of the gainfully employed, 35 per cent.

Other factors favorable to the manufacturer are the materially increased purchasing power of the agricultural population; a maintenance of minimum inventories by both wholesalers and manufacturers; increased exports with an increasing favorable trade balance; and a continuance of economic progress in foreign countries.

But there are also some factors that may seriously disturb the even tenor of affairs if they continue over an extended time, or increase in their influence: Frenzied stock market operations, which have resulted in money being directed into the financial districts instead of being used for productive purposes; high money rates, prevalent all over the country, which may retard near future industrial expansion; the trend toward price cutting, tending to increase volume of sales, at the same time reducing profits; incomplete agricultural recovery; excessive installment buying; the rise in selling and distribution costs; and the readjustments resulting from the mechanization of general industry.

Replacing Planers When It's Time

By John R. Godfrey

"DAD, how long have we had those Singraly planers?" asked young Tom Johnson the other day when I was in the office of the Johnson Motor Works.

"Why, they're almost new, Tom. Haven't had them over ten years, and a planer's good for twenty, the way we use them. Ain't getting the idea you want new planers are you?"

"You're some guesser, dad. Might almost think you were a fortune teller. That's just what I had in mind, dad."

"I might have known it, Godfrey," said Old Man Johnson turning to me. "Tom here can think of more ways of spending money than any one man I ever knew. And those planers only ten years old! Why, they're as good as new. Got a lot of work in them yet, Tom."

"Of course they have, dad, but not for us. They'd do fine in some job shop where a planer forms part of the scenery but isn't used on every job. But they're too slow for us, and they're taking up valuable space. We ought to get twice the production out of that floor space, dad."

"You ain't kidding yourself that you can run any new planers twice as fast as those we've got, are you, Tom? The work won't stand it."

"Not twice as fast, dad, but a lot faster—at least fifty per cent in most cases. But that isn't all. If you'll just watch a good planer man handle a job on one of these modern planers, you'll be surprised at how fast and how easy he does it. Controls at each side of the planer, no walking around to get at a control handle on the other side. Everything right under his hand. No horsing the cross rail or moving the heads by hand. He touches a lever, and zip, a motor moves it in half the time, and leaves him fresh for the real job."

"Might think you were selling planers for a living, Tom. Sounds like someone was slipping you a commission on the side."

"I'm selling planers all right, but I'm selling them for the Johnson Motor Works, and we'll make more out of them than the man who built them. He only gets his profit once—we get ours every day we use them."

"Let's get down to brass tacks, Tom. How much can their new planers save in dollars and cents?"

"Well, dad, take that 48-in. Singraly in the back shop. We charge $4 an hr. for that. I don't think it's enough, counting the floor space it takes, but call it four. Allow 300 days of 8 hr., to be easy, 2,400 hr., or 9,600 dollars. Say we only save a third—and that's low, and you have 3,200 dollars, a nice tidy little return on the investment, dad!"

"Sounds a bit fishy to me. 'Spose we chuck the old planers and buy new ones, and save all you figure we will. How long will you be satisfied—how soon will you want to throw out the new ones?"

"Dad, I'm surprised. You must be tired and need a vacation, for you've been progressive all your life.

"How long will I be satisfied with the new ones? Why just as long as there are no new machines that it will pay us to buy. It will probably be five years at least before it will pay to replace the new planers we're going to buy—it may be twice that time. But if the planer men design and build new planers that will make these new ones obsolete in two years, we can't afford to use these after the new ones appear. And that goes for every other machine in the shop too, dad."

"Can you beat it, Godfrey?" asked the Old Man. But I could see he was mighty glad to have a son who not only had progressive ideas, but had the nerve, and the ability to speak them out in plain English.

When welding cast iron, a tip slightly larger is used than in welding steel of the same thickness. The tip sizes recommended by the several manufacturers, for the welding of cast iron of various thicknesses are best.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Letting Small Savings Offset Larger Wastes

"I MET my old friend, Bill Thompson, last night," said foreman Ed one noon at lunch. "And he told me a funny one about the efficiency bird they've got over in their plant. He's been making a study of their drilling jobs, and finds a lot of things he wants to change."

"Such as?" asked his foreman friend Al.

"I'm getting to that, Al. He found they were breaking a lot of drills, and losing a lot of time from the machines standing idle. So he has the toolcrib man hand out a bunch of drills to each drill press hand in the morning so the man can have a new drill ready without going to the toolroom. Doesn't seem to care how many drills they use as long as they keep the machines running. Sounds funny to me, Al."

"It is a bit unusual, Ed, that's a fact. But I'm not sure that it isn't a lot more sensible than many things I've known them to do."

"I don't get you at all, Al. Think how much drills cost. He can't save enough of a man's time to pay for many drills—or he could check out a dozen if necessary."

"I'm betting that Mr. Efficiency Man has figured out the cost of drills, Ed. And he also knows that it isn't alone the saving of the man's time, it's the idle time of the machine that costs money.

"Then, too, he may want to impress the men with the value of time by showing them it is worth more than drills. But I'll bet that he isn't losing sight of the drill cost, either. They are probably small drills that cost very little, and the generosity in drills may have its effect in spurring production. Most of the men will appreciate the confidence he places in them, and not waste drills any more than before."

"Gosh, I didn't think you were such a booster for efficiency men."

"Well, it doesn't sound foolish to me, Ed. Of course, he must have found out how many drills it took per day before. And as for boosting the efficiency man, I'm for him when he's really efficient. A lot of them are not. I'm sure many shops waste a lot of machine time and man time by trying to save a few dollars on small tools."

"I can't see it at all, Al. Drills cost real money, and if the men get careless with them, it means a loss."

"Sure, Ed. But it's carelessness about *time* that I'm thinking of, and time is one of the most expensive things in the shop."

Is Ed's fear about losing money through waste of drills well founded? Or is Al right in thinking the cost of drills is probably less than the time saved? How about the impression on the men as to the value of time?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Making Foremen—or Importing Them

THE effect on the rest of the personnel of nursing along a toolmaker to be a foreman, cannot be overemphasized. A man risen from the ranks provides an incentive and inspiration to his fellow workers, in that they may hope to do likewise by proper application. Bringing in an outside foreman discourages all this, as the men feel they will never get any higher than their shop jobs, and can never climb into the executive ranks in that organization. The resultant loss is tremendous, for you not only lose added effort and concentration of the man who might ultimately win out, but also that of all who would compete in the race. Even though there may be only one winner, every man who makes the run gives something to the firm. —Wm. H. Donner.

I DON'T believe that the hiring of a new man would discourage the young men in the shop half as much as the giving of the job of foreman to a fellow employee whose chief claim to it is that he is the oldest employee in point of service. If there is a young man in the organization who has all the earmarks of a "comer," and who is all ready for it, I'd give it to him. Otherwise I'd go outside. Where there is no man ready for the job within the organization, it is far better to go outside for a competent man, than it is to establish the rule of seniority. —A. D. Kligman.

WHENEVER a foreman is taken into the company from outside there is likely to be some one disappointed whose good-will may be lost. Hence an outsider, appointed as a foreman, needs especially to possess ability to get along with men, and if there is any doubt on this score he should not be appointed, no matter what his technical ability may be. The foreman is always looked upon as the company's direct representative among the men, and the opinion of the men as to the company is based upon their opinion of the foreman.

—Frederick Kampmeir.

Finding New Ideas on Shop Visits

NO COMPANY sends a foreman on a visit to other shops simply because it wants to give him a rest. As the company pays the bill and is also deprived of the services of the foreman while he is away, I believe the company is justified in stating what should be looked out for and noted, while going through the different shops. It is certain that foremen are not sent out on good-will visits; they are sent out to obtain information that will make them more valuable to their employers.

Personally, I believe it will take someone higher than a foreman to get all the useful information requested by Williams, but an alert foreman can get much worth-while data when visiting a friendly shop.

Companies that can't afford to send out their foremen to acquire new ideas may do something just as good by following up the descriptions of production methods as published in the trade papers. —Samuel Kauffman.

THE · NEXT · TOPIC

Instructors for Shop Men

ADVANCE QUESTION

An instructor in a certain shop takes backward or unsatisfactory men and teaches them the right way to do things. Al favors it but Ed fears interference from the instructor. Is it practical to have such an instructor in the shop?

The Boss's Son in the Shop

THE boss who places his son in his own shop is doing an injustice to his son, and his whole organization, for, however earnest all concerned may be, it is next to impossible to treat him as though he were an outsider. If his foreman should succeed in treating him exactly as he did others, the other workmen in the department could never be convinced of the fact.

There are some things in a boy's life that are best obtained by his own experience, working for a time independent of relatives, or even friends.

—John Mark May.

Does Appearance in Tools Count?

THE question of tool appearance has been raised at various times in some of our large industries, with the idea of eliminating unnecessary costs. One concern, which manufactures upward of $300,000 worth of tools each year, devised the following control method:

The tool engineering department established tool finish standards, whereby all tool drawings were marked. All completed work was passed upon by the tool inspection department, in accordance with the standard called for. The standards set up were as follows:

1. All castings are to be free of irregularities, to be sand blasted, and machined only where assembly or working surfaces require it.

2. Non-working surfaces of steel and alloy bar stock are to retain the original surface, except where clearances are desired.

3. Forgings must be treated in the same manner, ex-

cept that objectionable draft is to be eliminated by a roughing cut.

By applying the above formula in a toolroom of any size, it will be found possible to save considerable expense, and place in production a tool which will be both sturdy and presentable. —Fred A. Schmidt.

A Chance to Grow

YES! There is a chance of gaining advancement in other countries, but it does not carry with it the comforts of life that the same chance does here. I am speaking more especially of England, as I have but little experience in other European countries. Competition for executive posts is much greater than here, and when obtained, one has a constant battle to retain it. There are always thousands of capable men ready to fill any vacancy.

Mechanics in England are being paid less than laborers in this country, and a foreman would find his pay envelope very little larger than these same unskilled men. The average American says: "But in England you can live so very cheaply." This is a very mistaken idea. To summarize it all: Competition is keen; executive posts are difficult to hold; money has a low purchasing value; and American standards of life and comforts are practically impossible to attain for the workman.

—Alfred Layzell.

Letting Good Men Get Away

A PROMOTION system which involves frequent transfers, is a most valuable adjunct to any personnel policy, where it can be worked out. Lines of promotion should be clearly defined wherever possible, and every effort made to create lines of promotion. Frequently, simple promotion schemes are effective, such as transferring a worker from dirty work to clean work, or from night shift to day shift.

One of the reasons why a well-developed system of promotions is necessary is that if some such scheme is not worked out, there will be small chance of preventing the department head from keeping his best workers in the jobs that they hold. He is out for production at lowest cost. That is why he is there. When he finally gets a round peg fitted into a round hole, and a square peg fitted into the famous square hole, he wants to keep the pegs right where they are, and not start his carpenter work all over again. But most good men will not "stay put" in the same job all their life. —S. Kupfer.

SEVERAL years' experience has convinced our company that surprises in the way of advancement of individuals occasionally occur when they cannot be anticipated. These are pleasant both to the donor and recipient, but as a matter of executive judgment, if any man has possibilities beyond his immediate job he should be so informed. The extent to which this information is qualified should be tempered by the characteristics of the individual. A word is sufficient to some, a lecture is needed by others.

When men hear nothing of such possibilities, if they are imbued with any ambition, it is only natural that they should seek advancement elsewhere, and in the majority of cases what appears to be advancement in another place is merely a change. We find it an excellent policy to urge our people to discuss offers made to them before they accept. Then, we discuss the situation with their interest in view as well as our own. We believe we have gained by this policy as it leaves the door open for the return of good men, if an opening occurs, and they desire to return. —N. J. Bowne.

THERE is no better way for a company to show a man that he has an opportunity with them, than to have men in important positions who have been promoted from the ranks. It is then often possible to encourage a man by citing examples with which he is acquainted, but it is never good to give direct promises of advancement which may not come to pass. Of course, if his promotion has been definitely decided, it would be well to let him know, unless the change will not take place for some time. —P. C. Cornish.

Capitalizing Criticism

IN THE foremen's meeting the foremen should be frank in dealing with one another. They should not indulge in personalities, but take it for granted that everyone else wants to decide the matter brought up on basis of fact instead of opinion. The shortcomings of another department should not be discussed unless the head of the department is there to give his version.

By being open in their dealings with one another, and preferring facts to opinion, the foremen will be able to use the conference method to advantage.

Capitalizing helpful criticism is a good way of aiding production efficiency. The foremen in their discussions will learn to understand the workings of other departments. They will understand that a foreman helps other foremen by performing his own duties efficiently. They will know the duties each foreman performs in relation to the other department heads' duties. Criticisms and suggestions about the work will aid in enlightening other foremen who previously had no understanding of the relationship of their departments to the rest of the factory. —Louis Shaffer.

Asking a Man to Come Back

UNLESS the job is a special one, for which another man was hired and would have to be released in order to take back the wronged former employee, there's only one thing Ed can do. He should take Al's advice, eat humble pie, and ask the man to come back. After Ed has extended his apologies and shown his sincere desire to make amends, the man in question can't help but accept his good intentions, and keep quiet about it when he gets back on the job.

If the man who is asked to come back, so far forgets himself as to broadcast through the shops in a cocky manner—that's another story. If this manner affects discipline, a call-down should suffice. If it doesn't he should be fired so quickly that his former dismissal will seem like a slow motion picture in comparison. As to the rest of the men, the foreman who can't chance being human for fear it will upset his discipline, deserves anything that fate has in store for him. It should not affect things one way or another to return a man who has been fired for something he didn't do. —E. J. Oerter.

Aluminum Alloys *in Metal Airplanes*

By Fred H. Colvin
Editor, American Machinist

Maximum strength and reliability in the white alloys so largely used in fuselage structures are obtained by special treatment

ONE of the peculiarities of the modern aluminum alloy is that it gains strength and stiffness quite rapidly after having been heated and quenched, or allowed to cool. This characteristic makes it necessary to work sheets and rivets of this material very soon after they have been heat-treated in order to avoid setting up strains and causing the development of cracks and other imperfections.

In order to secure the best results, the sheets must be trimmed and formed immediately after being heat-treated. On this account the heating bath, the quenching tank and the trimming and forming presses are placed in a group at one corner of the Glenn L. Martin plant so that the material passes from the furnace to the cooling tank and directly to the shear and brake, or forming press, without delay.

The heating bath and quenching tank are shown in Fig. 7 on the following page, with equipment for controlling the temperature of both. As can be seen, provision is made for handling the sheets by means of a light overhead traveling crane so that they can be easily lowered into the bath and, when the proper temperature has been attained, removed and dipped in the quenching tank alongside.

Immediately after heat-treating, the sheets go to the roll shown in Fig. 8, where they are leveled or flattened before being trimmed and formed. This operation is made necessary by the distortion caused by heating and quenching, the sheets not being in condition to be either sheared or shaped, as they come from the bath.

After flattening, the sheets go to the shearing press, Fig. 9, where they are cut into strips of the proper width to make the pieces desired for the various members.

After being sheared to width, the strips pass directly from the shear to the large brake shown in Fig. 10, where they are formed. This forming is a much more difficult operation than might be imagined, owing to the length of some pieces and the accuracy demanded. One of the interesting elements built up from these pieces is the Eureka strut illustrated and described in a previous article.

Fig. 8—Roll leveling machine for straightening and flattening the sheets after heat-treatment. The sheets are far from straight as they leave the bath and the heavy rolls shown take out the kinks and prepare them for the shearing and forming processes that follow

Behind the brake on which the various shapes are formed, is a substantial rack, Fig. 11, on which the forming dies are kept when not in use. On account of their length, it is necessary to handle these dies carefully; they must be well supported in order to avoid distortion that might affect the accuracy of the finished product. As will be seen, the rack is built up of structural shapes with angles for the tool supports. The upper parts of these angles are faced with wood to prevent marring the bottom faces of the dies. It will be noted that one of each pair of the end angles carries a stop to prevent the dies from being accidentally slid off the rack.

Some of the shapes made on the brake are shown in Figs. 12 and 13. The latter shows a section of the inspection department where the pieces are gaged in order to insure the correct size and shape of the assembled member. One of the inspection operations is shown at the right where a Rockwell hardness testing machine is being used to determine if the piece has been properly heat-treated.

In building up the Eureka section, the four flanged strips are clamped around a square mandrel as shown in Fig. 14, each end being held in a special chuck and the pieces held together by the tong shown in the center near the location of the rivet holes. The drilling head is indexed from point to point by means of the holes shown in the bar at the middle of the base of the fixture. The indexing pin automatically prevents drilling the holes in

The second of three articles. The concluding one will appear in an early issue.

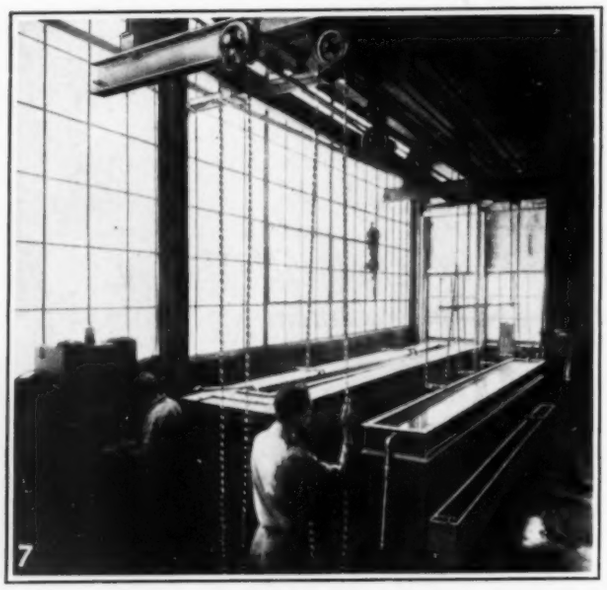


Fig. 7—Heating tank and quenching bath in which the Duralumin sheets are heat-treated before being straightened, sheared and formed. The temperature of both baths is controlled between fairly narrow limits. The sheets are handled by the light overhead traveling crane

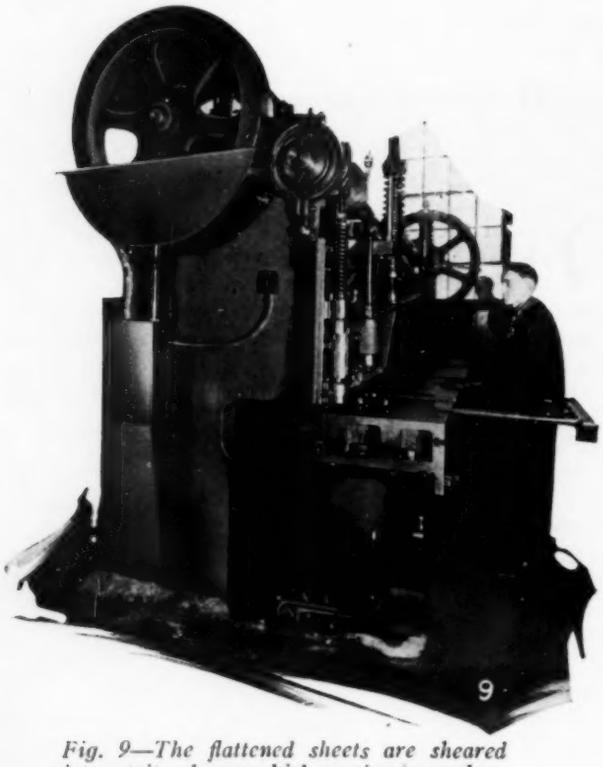


Fig. 9—The flattened sheets are sheared into strips from which various members will be formed. The machine is located near both the flattening rolls and the heat-treating furnaces in order that delay may be avoided in handling the material from one operation to the next

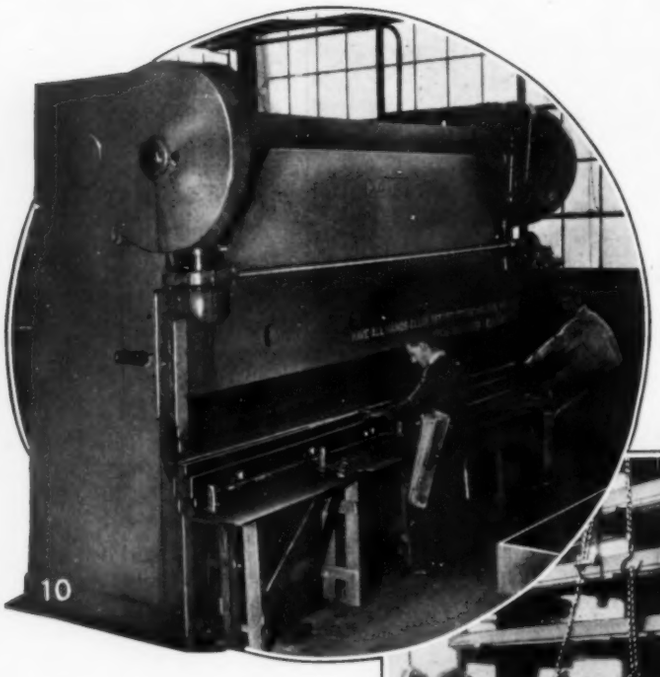


Fig. 10—The strips are formed on the large brake shown. Owing to the length of the dies, it is a difficult problem to secure just the desired form and size, at the same time holding the strips within the close limits required. It will be noted that a safety warning is always in front of the operator

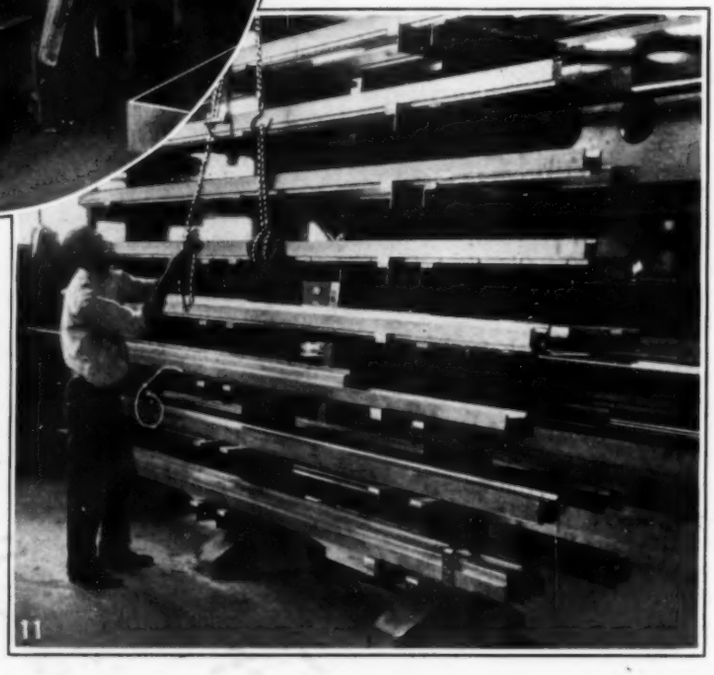


Fig. 11—Some of the forming dies used and the rack on which they are stored. Owing to their length, it is necessary to handle them carefully and to support them properly when not in use, to avoid distortion and consequent rejection of the work. The supporting arms are covered with wood to protect the dies; stops furnish protection against accidental slipping

Fig. 13—A corner of the inspection department where the formed sections are carefully checked for dimensions and imperfections. Some of the other sections and the Rockwell hardness tester used in some of the inspections are shown. These inspections are very rigid, because both weight and strength have to be considered

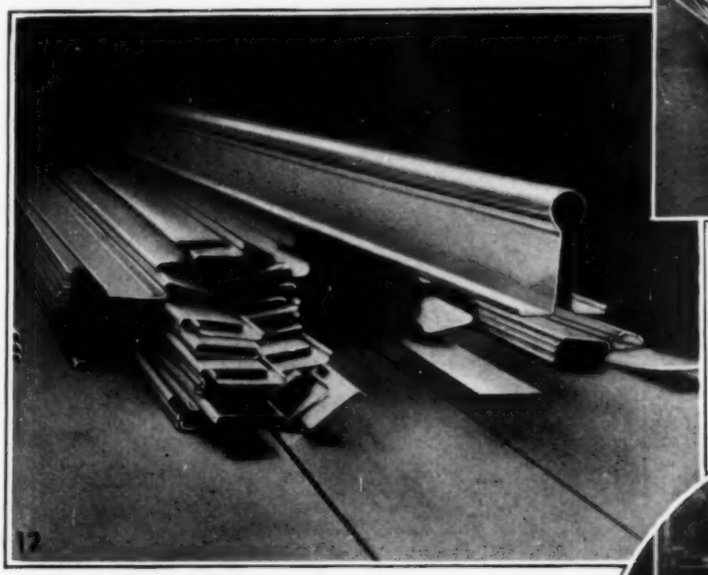


Fig. 12—A few of the shapes formed on the brake previously shown. The section at the right requires several operations and shows that both machine and die must be accurate in order to secure duplication

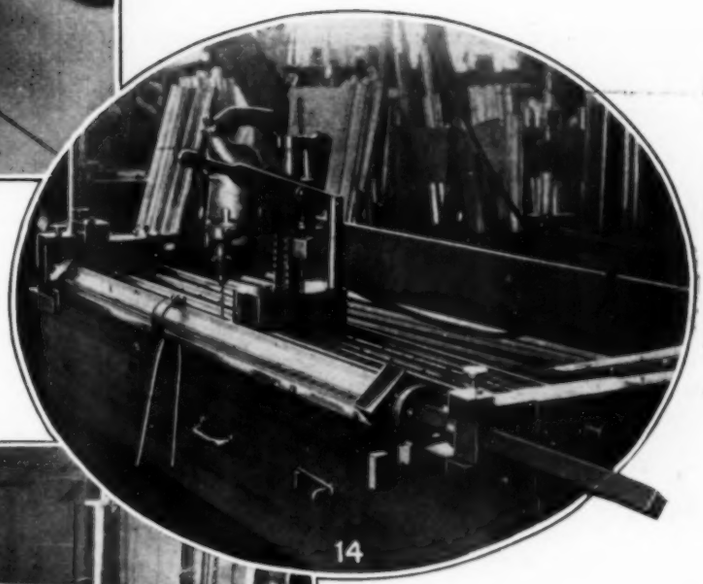


Fig. 14—Special drilling fixture for the Eureka section. The four pieces forming the section are clamped on the square mandrel shown and are drilled in accordance with the index bar shown. Correct drilling is insured because it is impossible to feed the drill into the work until the index pin registers with one of the holes in the bar

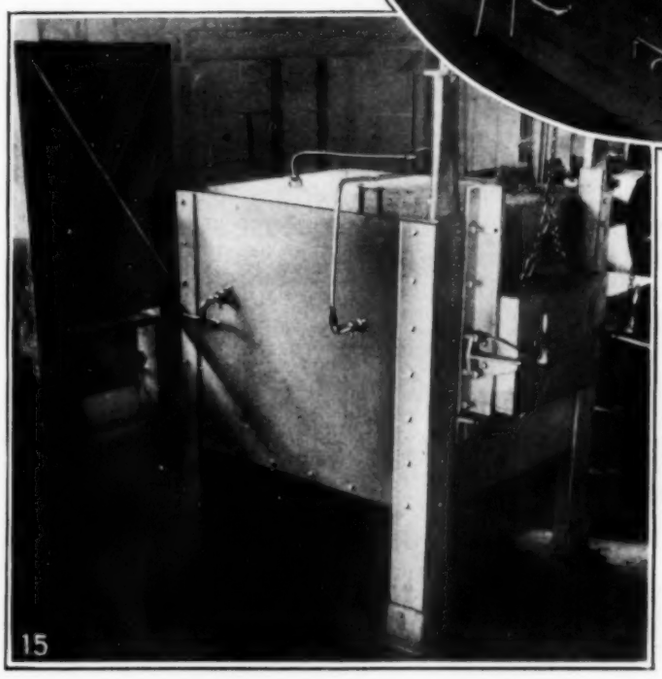


Fig. 15—Electric heat-treating furnace for Duralumin rivets and the continuous pyrometer by which the temperature is controlled and recorded. The record sheet is cut apart and the parts are tied up with the batches of rivets to which they refer and accompany them to the assembly or sub-assembly floors

the wrong place, because the drill cannot be fed into the work until the index pin will go through the hole in the indexing bar. This drilling fixture can be used on struts of various lengths simply by adjusting the chucks at the ends to the proper positions on the square bar.

For the same reason that it is necessary to heat-treat Duralumin sheets a short time before working them, the Duralumin rivets must be heat-treated. The electric heat-treating equipment provided for this purpose, as shown in Fig. 15, is equipped with a continuous-reading pyrometer and a Leeds & Northrup automatic heat control by means of which there is obtained a record as to the heat to which the rivets have been subjected. Rivets are heated between 925 and 950 deg. F. and are used within an hour of heat-treating. It is the duty of the man in charge of the heat-treating furnace to see that all rivets that are not used within an hour are returned to the furnace for reheating. This precaution necessitates the keeping track of each batch of rivets to prevent any hardening that might affect their life or strength as a part of the construction of the plane.

With the four pieces that go to make up the Eureka section held on the same mandrel as for drilling, the rivets are driven by a special squeeze-riveter, as shown in Fig. 16. This riveter has been designed and built especially for the work and has been found not only convenient, but a great time saver in driving the thousands of rivets that are required in these planes. Both the rivets and the spacers are kept in convenient metal boxes.

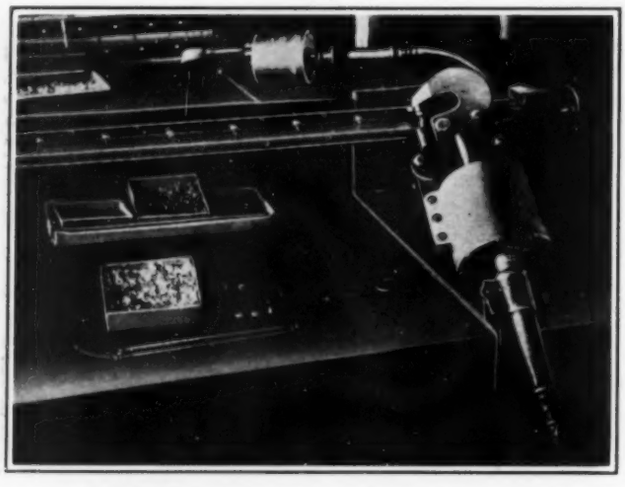


Fig. 16—Riveting the Eureka section with spacers between the units. The units are held on the same mandrel on which they are drilled and the special, squeeze-type riveter makes it easy for the operator to close rivets as fast as he can move from one to the next

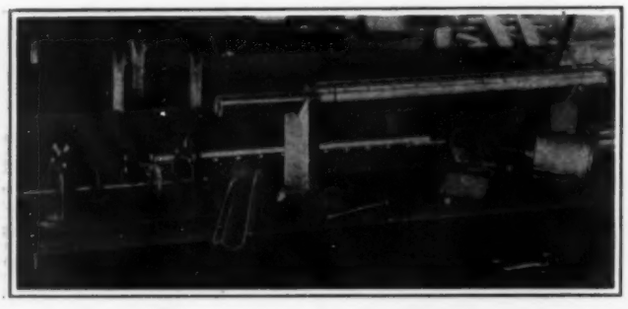


Fig. 17 — Drilling and riveting struts made of Phoenix half-round sections. The simple drilling fixture at the left consists of a base and an easily handled drill guide of two strips joined by two yokes. This is a less efficient fixture than the one previously shown, but it is used only on a comparatively small amount of work

While the Eureka section is used in most places in the construction of the fuselage, other shapes are found advisable for special places, one of them being the Phœnix section shown in Fig. 17. Here the strut is composed of two half-round sections using spacers and rivets. After drilling, the two pieces are wired on the round mandrel shown and riveted together in the same general manner as are the units of the Eureka section. This Phoenix section is used in pontoon construction.

Another drilling fixture, although not used in construction with any of the aluminum-alloy parts, is shown in Fig. 18, where the lugs that hold the engine in place on the plane are being drilled. The part shown is made up of welded steel tubing and is known as the engine bearer. It is held on the front of the fuselage by four bolts in the same way as it is held in position in the drilling fixture. The fixture itself consists of a substantial base plate and structural steel uprights that support the engine-mounting framework firmly in position. They also support the drilling head, which is mounted on an upper plate of the fixture. The engine bolt holes are drilled in several lugs that are welded to the front ring of the engine mounting.

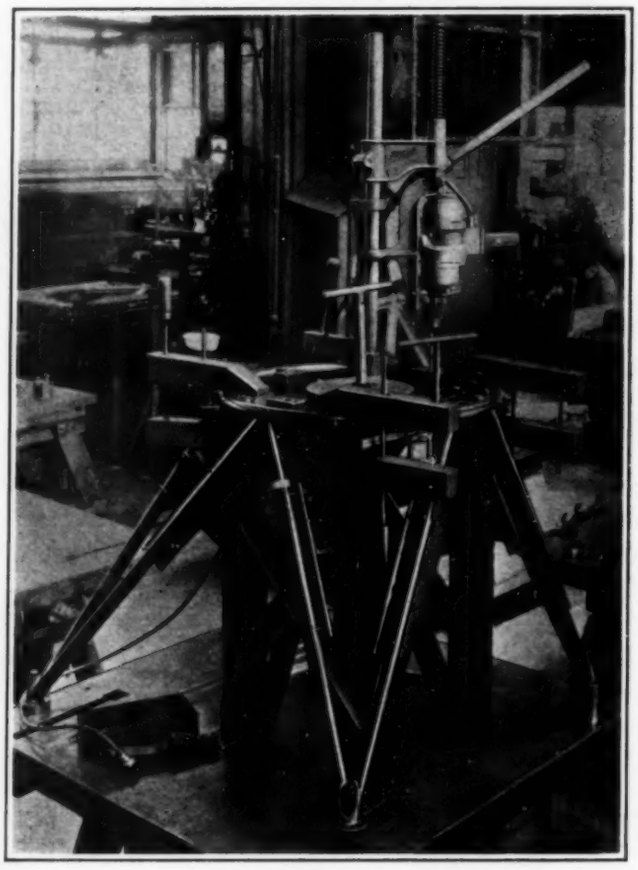


Fig. 18—Fixture for drilling the bolt holes in the ring in front of the engine mounting. The framework of the engine mount is held on the substantial base plate of the fixture and the drilling head is mounted on the upper portion, supported by structural members

Progress in Machine-Shop Practice

Abstract of Report of Machine-Shop Practice Division American Society of Mechanical Engineers

Compiled by L. C. MORROW

Chairman of the Division and formerly Managing Editor American Machinist

IT IS the object of this report to summarize the progress made in machine shop practice during the 18 months concluded by the year 1928.

In last year's report it was predicted that during 1928 there would be further use of hydraulic feeds and drives, anti-friction bearings, heat-treated alloy steels, pressed-steel and welded parts, automatic lubrication, safety devices, and automatic operation. In every respect this prediction has come true. The ideal in machine shop practice, which in its broader sense includes the design of metal products, as well as the operation and management of the machine shop, sets up as a goal the production of improved products at reduced production cost; procedure along the lines indicated was, therefore, to be expected.

Also, as predicted, progress has been made in the development of standards, notably in Woodruff keys, machine tapers, gear nomenclature and other gear standards. There still is much to do in the way of standardizing nomenclature, initial machine speeds, machine-tool capacity and performance, belt-pull, and so on.

RADICAL IMPROVEMENTS IN CUTTING TOOLS

Radical improvement in cutting tools was foretold, although the time of the appearance of such developments was left indefinite. It is gratifying, therefore, to be able to report that there have been placed on the market new steels and new alloys that are claimed to be capable of removing much more metal than is customary during a unit of time; there are, also, cobalt-steel drills for drilling manganese steel. There is evidence in the introduction of these new steels, or alloys, that within a few years our present-day metal-working machines may be entirely obsolete so far as their capacity, relative to the capacity of cutting tools, is concerned. This situation indicates that the production policy from now on should be one of extracting from equipment of present design all of the production of which it is capable. There should be no pampering—no policy of conservatism, so far as the ultimate life of the machines is concerned. No policy of neglect, or lack of maintenance, is advocated, however, since upon the condition of the working equipment depends the quality of output.

While there have been some outstanding developments since the last report of the Division, the period as a whole has been one of refinement of the features of advanced design initiated during the preceding period. According to one contributor to the data from which the report is compiled, there has been a "marked tendency toward the concentration (by manufacturers) on those types of machine tools that are of more or less standard construction, but are adaptable by the use of attachments and special tooling to the highly specialized requirements of continuous production. It would seem, for the time being, at least, that American manufacturing progress has definitely settled on this type of production machine, rather than on the completely special machine on the one hand, or the standard machine with simple tooling and multiplicity of simple operations, on the other." This conclusion appears to be well founded and admirably expressed.

Another contributor, looking at the economic rather than the operation side of the progress in machine shop practice, says, "I believe these (the most significant developments) are primarily the return to quantity production in the Ford plant and some of the methods employed in that production." The Ford return to quantity production was without question of great importance. Several automobile makers and many parts makers were marking time until they knew what Ford would do. Tool makers were in the same condition. This period of stagnation was changed into one of activity once Ford had exhibited his new product.

Still considering the economic side of progress, and referring to the more or less exaggerated statements concerning unemployment, the same contributor states, "—this subject of unemployment developed a sort of research which uncovered new economic factors in the refining of industrial methods and equipment. It rather points out in some cases that the progress in machinery is faster than the changeover in worker intelligence, for at times the adoption of newer methods must be slowed up to accommodate the transition of workers employed, either by absorption in other processes or by accustoming them to the demand made on their intelligence by the newer method." This statement is an attempt to analyze one phase of the mechanization of industry.

DEVELOPMENT OF PRIMARY FUNCTIONS

Somewhat by way of prediction is another contributed statement: "A point that is in evidence is the development of primary functions and their use, and the combination of these in conforming to any given process required in production. There is a tendency to make primary motion and integral parts of the machine more nearly conform to the requirements of production in their mechanical limits and in the number of functions that are combined. Standardization in such units is, of course, conducive to economy of manufacture and simplicity of repair, and makes the completed piece of equipment more exactly fitted to the exact requirements of the job; that is, we will not have in future equipment so much compromise, having at some times too much machine for the job and at other times too much job for the machine." This line of reasoning, although ex-

Other members of the Executive Committee: Carlos De Zafra, Secretary; J. H. Connolly, J. W. Hook, W. W. Tangeman, and W. J. Peets.

pressed by a single contributor, may be expected to represent the thought of at least a minority of the machine-tool-building industries, and indicates a fair consideration of the machine-tool user's needs.

Passing to the less general, the direction of progress, as measured in terms of machine-tool development and the improvement of processes, in indicated by:

1. Increased rigidity and further ease in and rapidity of manipulation
2. Increased use of welding, including multiple-spot welding
3. Further application of hydraulic feeds and drives
4. Greater use of alloy steel gears and shafts
5. Extended application of anti-friction bearings
6. Greater attention to lubrication, directed especially toward making it automatic
7. Developments in honing equipment
8. Developments in forging methods and equipment
9. More extensive motorization, including the use of separate motors for auxiliary purposes
10. Increased use of diamond boring
11. Development in processes of finishing the teeth of gears, including the burnishing and shaving methods
12. Improvements in balancing equipment
13. Wider adoption of multiple V-belt and multiple-chain drives
14. Increased use of the coining operation to secure closer finish
15. Wider application of grinding

Among the outstanding specific developments, including processes and equipment, are the following:

16. Brazing in an atmosphere of hydrogen, and the furnaces to acomplish this process
17. Small sizes of jig borers
18. Automatic plating, using integral conveyors
19. Application of conveyor assembly methods to general manufacture
20. The gear shaving machine
21. A hardness-testing machine by which balls in great number are dropped on the surface to be tested, the amount of marring that results being in inverse ratio to the hardness
22. A milling machine with hydraulic table travel
23. A process of magnetically controlled carbon-arc welding
24. Alloy tools for cutting manganese
25. Developments in the nitriding of steel
26. An improved generator, for producing continuous-toothed herringbone single-helical and straight-toothed gears
27. Application of the unit milling head to the planer-type milling machine, employing two motors, one for the spindle and one for traversing the head and the spindle quill
28. A die-casting machine of automatic operation, the only functions of the operator being to manipulate the single clutch lever, supply new metal, clear and oil the die with an air hose, and watch the castings
29. An automatic internal grinder in which the wheel starts grinding from the rear of the work
30. A hydraulic crankpin grinder which finishes all crankpins of automobile crankshafts in one set-up.

Grinding continues to develop rapidly. The centerless type of machine is now being used on applications formerly considered entirely out of its field. Use of the center-type is being extended. The grinding of castings is being carried out on a scale larger than ever. Grinding as a process is finding its way into the railway repair shop; it has met with wide reception in some shops, while in others it has been received not at all, or reluctantly.

In the realm of heat-treating and metal forming, high-carbon, high-chromium die steels have met with great success in some quarters. The heat-treating of steel for pressed-steel parts has been selected as an outstanding development by a contributor representing a manufacturer of pressed-steel parts in large quantities. He says, "—I think that the greatest advance likely to be found in the field of pressed steel is that of preliminary heat-treating of the steel itself in such a way that it is caused to be self-supporting through a great many operations where it was formerly thought necessary to entirely confine it between the surfaces of the dies."

The finishing of machinery is undergoing some change. Lacquer finishes are being applied in some instances. Color is being gradually adopted and widely considered. There is some speculation as to whether or not it is advisable for color standards to be adopted by the manufacturers of classes of machines. Certainly more thought is being given to the finish of machines, and labor-saving handling equipment is being introduced into the finishing operations.

Perhaps the influence of developments in other fields affecting machine shop practice is best analyzed in the following quotation from one of the contributors to the data for this report: "The principal development in other fields of manufacture that have affected our own field relates to the increasing concentration of continuous production into fewer and stronger hands and the insistent call for improved machinery created by this intensive competition."

Importance of Obsolescence Realized

Another contributor mentions the recognition of obsolescence upon the part of equipment users as an important development, which, of course, it is. That this matter of obsolescence is considered important in other fields is indicated by the action of the Department of Commerce in reaching the determination to undertake a study of industrial equipment to determine, among other findings, the amount of obsolete equipment and its importance as a factor in the inability of firms manufacturing similar products to compete on an equally profitable basis.

Research has held a position of importance in machine shop practice. The machinery industries are conducting a considerable amount of practical research upon problems with which they are immediately concerned, the stimulus being competition which calls for quicker methods of production or the substitution of cheaper materials on the one hand, and possibly more expensive materials with a smaller machining cost on the other.

It seems that much of the research by individual units of industry is undertaken merely to meet immediate conditions, and, having satisfied those conditions, the results are lost to the industry as a whole. There is, also, evidence indicating that the engineering profession as a whole has yet to be educated to the fullest use of research libraries.

Just a year ago the Machine Shop Practice Division

organized a Committee to determine projects for research. By members of this committee alone 62 projects have been suggested. For the most part these suggestions are worth serious consideration, irrespective of whether they are subjects to be undertaken by ourselves or by other societies or research organizations. The suggestions have been analyzed by the committee; some have been referred to other societies, and some have been considered as desirable for commercial investigation alone. Several have been recommended to the Division as worthy of immediate action and such recommendations have been indorsed by the Division in transmittting the report to the Main Research Committee.

It is gratifying to know that there is a constantly increasing favorable attitude toward standardization upon the part of manufacturers and that the manufacturers are co-operating more than ever to bring about much-needed results.

By a group of men who represent a cross-section of the machinery industries, development along the following lines is expected during the coming year:

More universal use of nickel and semi-steel in iron castings

Improvement of die-casting material and increased use of die castings

Replacement of scraping by grinding as the predominant operation in finishing sliding surfaces

Development of cutting tools of greater capacity

Standards for the noses of lathe spindles

Wide adoption of integral-motor drive

Application of small conveyor and materials handling installations

Still further general application of grinding

Use of higher grade materials

Improved lubrication methods

More attention to rust-proofing

Further application of anti-friction bearings

More hydraulic applications

Extended application of flanged motors

The use of larger chip pans on production machines

Production layout around materials handling system

Solution of the problem of a standard taper for machine spindles and the shanks of small tools

More definite recognition of the economic drawback acompanying the use of obsolete equipment

Wider use of welding

More extensive replacement of castings and forgings by welded steel

Substitution of automatic machinery for hand labor

Reduction of stock on castings allowed for machining

Extension of piece work

More efficient training of apprentices

Changes in the design of machine tools to be made necessary by expected changes in manufacturing methods that will be required on acount of predicted changes in automobile design to bring about cheaper methods of manufacture

Adoption of uniform cost acounting methods by groups within the metal-working industry

Greater recognition of the value of research. (According to a survey by the Division of Engineering and Industrial Research of the National Research Council, 187 "millionaire" manufacturing companies in the metal-working industries have an average yearly expenditure for research of $68,300).

We may confidently look forward to much that will be new during the year 1929 on account of the stimulus that will be provided by the second National Machine Tool Builders' Exposition, to be held in Cleveland in September. The advent of 1929 finds machine tool builders as a whole in very good position. They have enjoyed a year of business that has not been surpassed since 1920, and it may be expected that they will make every effort, by way of design, to continue existing prosperity. Moreover, for some of them, foreign trade has been exceedingly good, and on that account makes its appeal for continued effort.

Recent Cases in Engineering and Patent Law

REVIEWED BY HERBERT BRAASCH
Attorney-at-Law

THE following paragraphs contain the substance of some court rulings on cases in mechanical engineering and patent law. Cases are taken only from the higher federal courts and from the state supreme courts. Legal terminology has been reduced to a minimum. Each case is designed to cover briefly all of the points essential to an understanding of the factors involved. Other "recent cases in mechanical engineering and patent law" will be reviewed by Mr. Braasch from time to time.

Guards and Safety Appliances

Statutes in most states require guards for gears, belts and other moving or cutting machine parts. The West Virginia law is typical. It provides that "all power-driven machinery, including all saws, shall be so located, whenever possible, as not to be dangerous to employees, or where possible be properly inclosed, fenced, or otherwise protected."

A shop employee injured in the use of a power saw brought suit against his employer, not resorting to any workmen's compensation law. The employer answered that the operation of this saw was not part of this mechanic's duties, and that he had been warned not to use it. However, the jury decided this matter against the employer.

A further contention was that the saw, properly used, was not dangerous. The court held that as a matter of common knowledge such cutting tools are dangerous, the probability of injury being so great that the legislature had imposed specific precautionary requirements. Such law created a new standard. Reasonable care and the adoption of the prevailing shop practice do not meet the standard that such law sets down. Compliance is not proved by showing that other shops operate in like manner, or that the machinery had been approved by the state factory inspector.

There is nothing left to the discretion of the employer, and his duty to isolate or guard power-driven tools and machinery is imperative and absolute, if it is possible to do so. The law is to prevent accidents that are the result of incompetence or are avoidable, as well as those that are not. *(Additional cases on following page)*

Invention of Guard Not Required

A guard is "possible" under this law if it does not interfere unreasonably with the efficiency of the machine. It does not exact inventive genius to design a guard, but it does require ordinary diligence to procure or devise a reasonably suitable one.

Evidence that guards are used in connection with similar machinery may be admitted to show such guarding is possible, and in the court's discretion the jury may be permitted to view machinery in operation to judge whether the guard is suitable.

Violations of such laws are not uniformly treated in the various states. West Virginia takes the view that, if the accident was one intended to be prevented, injury is considered as directly caused by the non-observance of the law. That no prior injury has resulted from operation is immaterial; nor need the worker show the precise way in which an injury that has occurred should have been anticipated by the employer. It may be shown that the use of a guard would not have prevented the injury, but it may not be shown that injury might happen even with a guard.

In some other states recovery is dependent upon whether the particular injury is foreseeable from its unguarded condition. So, if the injury could not be reasonably foreseen, the employer is not liable in such states.—*Tarr vs. Keller Co., West Virginia.*

Aggregation of Already Known Elements Is Not Invention

Forgings and other parts were made and assembled into graders by the Galion Iron Works in such a manner as to substantially duplicate the product of the Adams company, who thereupon started a patent infringement suit.

The common elements of all graders are a pair of front and rear wheels and connecting frame which carries a mould board. Starting with these, inventors had directed their efforts to counterbalancing lateral thrust, eliminating side draft and varying the relation between the path of the grader and the dirt shifting mould board. All of these patents had expired.

The Adams company selected, combined and incorporated into a single grader a large number of the desirable features of such existing graders, and made patent application.

The Galion Iron Works contended that the combination was not patentable; that each element performed, in the Adams combination, precisely the same functions and realized the same advantage that element had previously performed; that bringing together elements selected from old machines to perform the same functions they severally performed in the machines from which they were taken, and producing the same result, is not invention. This contention was accepted by the court which held Adams' patent invalid.—*Adams vs. Galion Iron Works & Mfg. Co., (Federal) Northern District of Ohio.*

Factory Inspection as Proof of Quality and Condition

J. B. Colt Company sued a purchaser for the contract price of a carbide generator with appliances and fixtures. The purchaser contended that the equipment did not come up to the manufacturer's warranty. The company was allowed to prove fulfillment of its agreement by introducing evidence showing that the fixtures were inspected before they were packed for shipment, and the method of inspection at the plant.

As a witness the inspector who passed the generator was permitted to testify: (1) That inspection disclosed the generator to be made of thoroughly durable galvanized steel of perfect workmanship and material; (2) that it was automatic in action; (3) that shipment was made, and (4) that the apparatus was in perfect condition when shipped.

Had the inspector not been personally familiar with all the information on which he based his answer, the court could have struck out such matter as to which he was not reliable.

Evidence that other generators installed by the company were giving satisfactory service was excluded, because it was not proof that this particular generator was satisfactory.—*J. B. Colt Company vs. Baker, Kentucky.*

Standard Warranty Construed Under Uniform Sales Act

Tractor, breaker bottoms and plows were sold under the following contract: "The undersigned asserts that he enters this order upon the inducement of no other representation than that contained in the standard warranty of the manufacturer as hereinbelow set forth.

"Allis-Chalmers Manufacturing Company guarantees that it will repair f.o.b. its factory, or furnish without charge f.o.b. its factory, a similar part to replace any material in its tractors which within one year after the date of sale is proven to the satisfaction of the company to have been defective at the time it was sold; provided that the purchaser shall record with the company, within ten (10) days of the date of delivery, the number of such tractor, and provided that all parts claimed defective shall be returned, properly identified, to the company at Milwaukee, Wisconsin, charges prepaid.

"Purchaser agrees that retention or possession for more than six (6) days after the first day's use of such machinery purchased herein, shall be construed as conclusive evidence that the warranty has been fulfilled and that the company is thereby released from all further warranty except as to defective parts."

The purchaser contended that this contract was made subject to the sales act (the uniform sales act is law in practically all states); that, if the seller is appraised of the use for which the buyer intends an article, and the buyer relies upon the skill and judgment of the seller to furnish it, there is an implied warranty that the goods are reasonably fit for that purpose. If the goods are not so fit for the purpose, the buyer may, within a reasonable time, rescind the contract, the above signed contract notwithstanding. The provision as to six (6) days' retention being conclusive evidence that the warranty has been fulfilled, does not apply to defective parts permitting evidence of a breach of this warranty, though goods have been retained a longer period and the contract rescinded on that ground. The court upheld these contentions of the buyer.—*Allis-Chalmers Mfg. Co. vs. Frank, North Dakota.*

Plastic bearings have been successful in submarine engines, according to experiments conducted by the Bureau of Engineering, Navy Department. In order to reduce the risk of bearings seizing or burning out due to improper clearance adjustment, unequal expansion, or insufficient oil, these high-lead-content bronzes were tried. One brand proved up without oil at a shaft speed sufficient to melt high-temperature white metal. The shaft did not seize and after stopping could be started again. No wiping of the bearing occurred, and apparently there was no wear.

Boiler Scaling Simplified by Sand Blast

A practical unit for removing scale and corrosion from the interior of locomotive boilers by using a combination of air, water and sand

PRIOR to the use of a sand blast for cleaning the interior surfaces of locomotive boilers, the practice followed by the Northern Pacific shops at Brainerd, Minn., was the air-hammer method. On account of the excessive noise created by the hammers, workmen objected to having the operation carried out during the regular working hours, with the result that cleaning had to be handled after the day shift had finished working. This arrangement often caused delay in the repairing of boilers and the reapplication of flues, which in turn had its effect on the scheduling of locomotives through the shop. With the present method of sand blasting, however, cleaning is done during regular shop-working hours without interference to other workmen.

An outstanding feature of the sand cleaning process is the cost reduction it affords. For average boilers, the scaling and cleaning required from 24 to 32 hours with the hammer method, whereas the same work is carried out in from 8 to 10 hours with sand blast. In addition, sand gives a better job because the cleaned surface is made smoother, with the result that it has a tendency to resist scale formation longer than a hammer-cleaned boiler. This condition, of course, has its effect in decreasing maintenance costs and in increasing the boiler operating efficiency. The absence of dust is also an item.

The cleaning equipment consists of two main units, a portable sand tank and a combination nozzle. Mounted vertically on a frame having four spoked wheels, the tank holds sufficient sand for approximately four hours' operation. The general arrangement of the tank unit is shown in Fig. 1. The nozzle is of special design, being made with three connections, one each for air, water and sand. One of these units is shown in Fig. 2. The inclusion of water with the sand and air is to avoid dust, as well as to aid in washing the sand from the boiler.

Of considerable importance is the nature of the sand used. A good grade of silica sand proves most satisfactory, since it has cutting qualities that remove scale and corrosion freely. It can also be used over again which likewise reduces the cost of scaling. Tests have shown that such sand can be washed and dried twice. Beyond this point it loses its cutting qualities and increases the time required for cleaning of the boiler.

Washing and drying of the sand is done outdoors in the summer and indoors in the winter. The purpose of washing is to remove any scale and other formation which may have been collected, while the drying is done to insure having the sand pass freely from the tank unit to the nozzle. For indoor drying the sand is placed in shallow bins located in the boiler shop and for outdoor

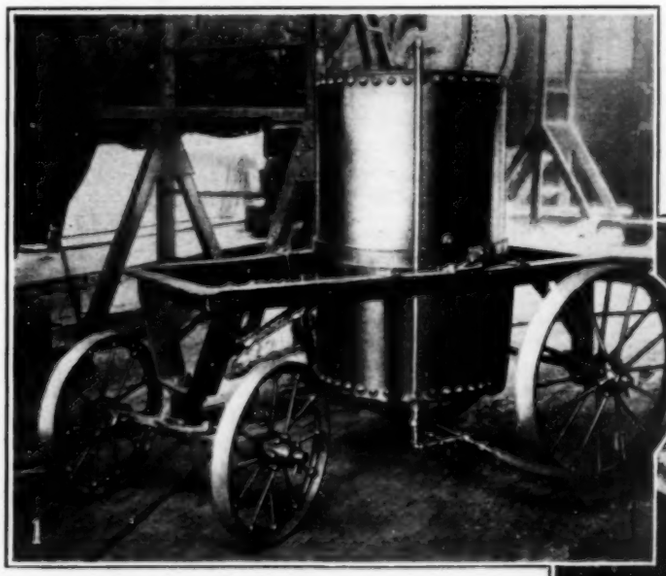


Fig. 1—When boilers were cleaned by the hammer, on account of the excessive noise, scaling was handled after working hours. Since the sand-blasting method has been adopted, however, the work is carried on at any time without interference. One of the main units of the scaling equipment is the portable sand tank shown

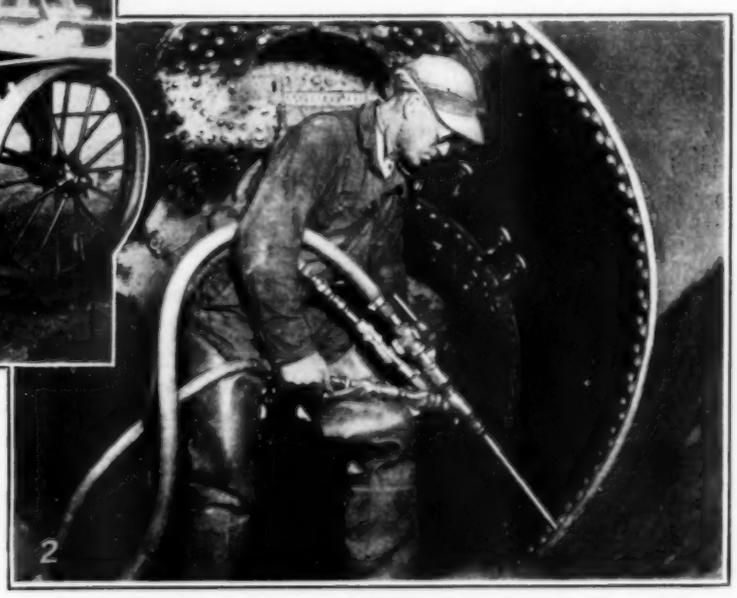


Fig. 2—Scaling the interior surface of a boiler with a special nozzle that uses a combination of air, water and sand under equal pressure. A special grade of silica sand has been found to possess free-cutting qualities that remove scale and corrosion freely

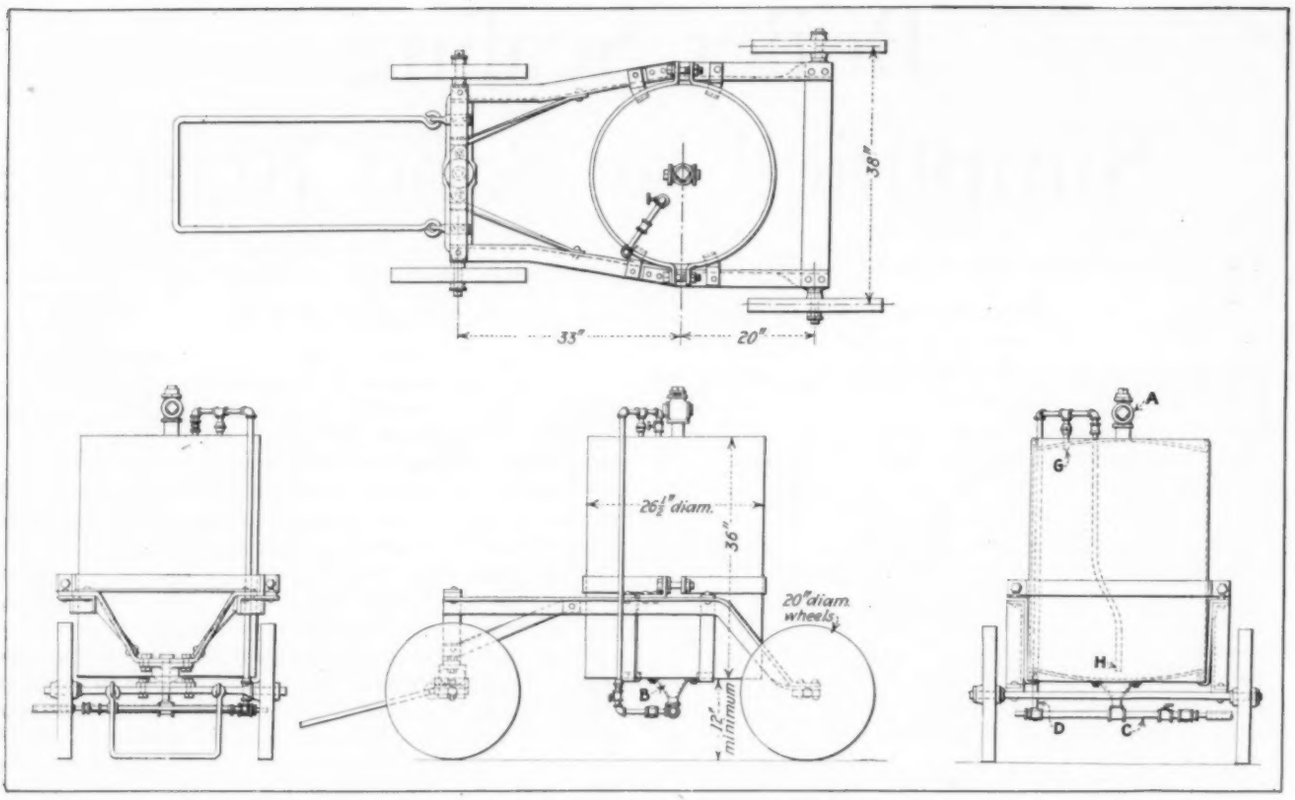


Fig. 3—The sand tank is mounted on a frame that is carried on a four-wheel truck. The capacity of the tank is 1,100 lb., which is equivalent to a four-hours supply. Approximately 2,200 lb. of sand is required to clean the average boiler. Air pressure is admitted to the top of the tank to insure having the sand flow freely through the funnel and into the lower pipe line from where it is forced to the nozzle

drying the sand is spread out on a platform where the sun can strike it. The drying and re-use of sand may not be justifiable in a territory where a good quality of silica sand can be secured at a comparatively low cost.

Constructional features of the sand tank unit are shown in Fig. 3. Sand is placed in the tank through the cock *A*, by removing a pipe plug at the top. Approximately 1,100 lb. of sand is the capacity of the tank. At the bottom of the tank is the outlet funnel *B*, which allows the sand to enter the pipe line *C*. Air pressure is admitted at one end of the pipe line and a hose connecting the nozzle is attached at the other end, thus forming a method of forcing sand under a pressure to the point of use. An additional air outlet is taken from the pipe line at *D*, which in turn enters the tank at *G* and *H*, insuring a positive flow of sand through the funnel in the event the sand should become damp.

Details of the nozzle, which is made of pipe fittings welded together, are illustrated in Fig. 4, showing the connections for air, water and sand. To operate correctly and to give the best results, the pressure of the three elements should be equal, or as nearly so as possible, preferably at 100-lb. pressure each. At the bottom of the illustration is seen an enlarged section of the nozzle outlet showing how the sand passes through a section of ¼-in. pipe to the end of the outlet and how the water and air mixture passes independently of the sand to the same point. By this arrangement mixture of the three elements does not take place until they reach the end of the nozzle outlet.

The unit offers a practical and efficient method of scaling boilers, making it possible to detect any cracks, pits, signs of overheating or deep defects that may require repairing. Through its use, by producing a well-cleaned surface, edges of plates, laps and seams, where cracks usually develop, may be given a better and more thorough inspection.

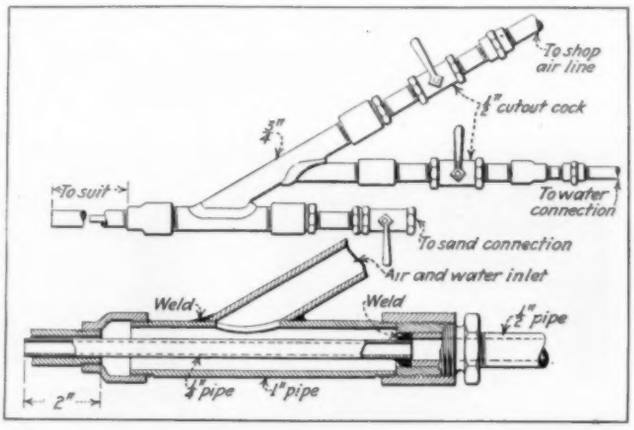


Fig. 4—Construction details of the nozzle are shown here illustrating how the air and water mixture passes independently of the sand line until the three elements reach the end of the nozzle. The unit is made of pipe fittings welded together, so that the air, water and sand connection can be attached conveniently

In the grinding of aluminum alloy castings such as automotive pistons, a clean wheel and clean cutting lubricant are essential. A mixture of kerosene and lard oil is used as the lubricant, and is strained in order to remove any particles that might scratch the work. Medium high wheel speed and high work speed are necessary to assure a good finish.

Management Engineering in the Smaller Industrial Plants

By J. E. Dykstra
Factory Manager, The Champion Company

MAN power in industry can be directed to its highest state of efficiency only by proper guidance and proper planning, and it is needless to refer to what competent engineers can and have accomplished along these lines.

Certain factors that make for efficient operation are grouped below in the order of their usefulness in establishing a workable system not entailing too great a cost to the average small industry. They are:

1. Production control
2. Grouping of equipment and its classification
3. The personnel or man power that makes the successful operation possible.

Production control can be separated into such main items as proper scheduling, routing, stores control, costing, and purchasing.

A careful analysis of these requirements usually enables one to foresee future needs with a reasonable degree of accuracy, and by knowing the time required to obtain the necessary materials, a scheduling system can readily be worked out that will meet all requirements. A knowledge of the production capacity of the various departments is of vital interest in establishing a proper scheduling system.

In order to determine the production capacity of various departments it is, in the author's opinion, quite essential to study in considerable detail the suitability as well as the grouping of the equipment to produce the desired part. In general on the heavier classes of work it is best to arrange the necessary equipment in the same sequence as the operations to be performed.

Material Travels Toward Assembly End

In the author's opinion a proper routing of parts through the factory is obtainable only by keeping in mind the fact that material, when once it has left the stock room, should travel in the general direction of the assembly or finished-stores department. Operations, as well as the departments, can best be designated by numbers. The various operations such as boring, turning, milling and grinding, can be assigned numbers arbitrarily. These operations can readily be designated by their numbers and they should appear on the operation card according to their logical sequence.

It is quite necessary that all job tickets on which work has been performed during the pay period are sent at the close of the pay period to the time-keeping department so that the total for each man for the period can be checked against the time recorded on the factory entrance recorder.

In the author's experience, minimum costs are obtainable only through a system that accounts for every minute of the day that is spent by the employee in the shop. Any of the many elapsed-time instruments on the market today can be depended upon to paint a true picture of the employee's activities. The average workman, thanks to our changing industrial conditions, is satisfied that management's greatest need today is greater production at less cost, and experience has taught him that when these conditions are obtained, they are of necessity reflected in his pay envelope.

In considering the tooling possibilities it is always necessary to consider the tools available and the time required with these tools. With this factor known it becomes comparatively easy to determine the possible savings with more elaborate fixtures. With a fairly well-known production, figures are readily obtained to determine whether or not the more elaborate equipment is justified. Many tools would be discarded as readily as the car model of a year or two ago if modern equipment were considered in terms of saving of man-hours instead of saving in dollars and cents per unit produced as is most generally the case. Facts bear out the assertion that in general new equipment materially reduces the departmental overhead through the absence of repair costs and shutdowns and also decreases the general overhead by increasing sales that the better product often makes possible. In many cases it is advisable to determine such items as interest and depreciation on the basis of departmental units, as it aids materially to determine the proper selling price of the product. It is generally conceded that when the proper standards of both productive and non-productive shop operations are determined, the performance of the department as a whole closely adheres to these standards.

Purchase Information Necessary

The necessary purchasing information is a vital element of the production-control group, due to the fact that shortages of material hamper production and too much material ties up capital uselessly. It is also a conceded fact that small quantities are conducive to higher prices and it becomes important, therefore, that parts common to various products manufactured in a plant be purchased in the most economical amounts possible.

While there are, no doubt, many men who work neither for money nor fame, but for the joy of the working, facts amply testify that in general all human endeavor is directed toward the reward that it brings. A cost-reducing plan, therefore, that does not bring its rewards and its encouragements to those who carry it out, will never attain its full possibilities.

Airports cost money, but all wide-awake towns and cities are realizing their importance. Just how to get them is another story, and the Chamber of Commerce of Danville, Ill., has called for a conference of other similar bodies in the State to consider ways and means of raising funds for airports. The three methods seem to be, by stock company, by donations, and by municipal taxation. The first two are seldom successful, and there are legal questions as to the last method, hence the conference. The interesting feature of the situation, however, is that cities are realizing the necessity of providing adequately for air transport. Such provisions will increase the use of planes, and so aid all industry.

Abstracted from a paper presented at the annual meeting of the A.S.M.E., held in New York, December 3-7, 1928.

Germany's Industrial Organization Occupies a Unique Position

By Our German Correspondent

THE recent labor conflict in the heart of Germany's industry, by far the largest of post-war years, has again put into relief the unique organization of German industry.

The German procedure of settling labor disputes had tended to increase wages automatically and regularly. This procedure is founded upon law, whose abolishment or amendment, therefore, is a matter of parliamentary business. The German parliament was not likely to move in the matter, unless great distress in industry became manifest, and the manufacturers, of course, did not want to wait until such a condition took place. The case was extremely difficult and required skillful treatment. A campaign looking far into the future was laid out and patiently carried through. Slowly, almost stealthily, industry, prepared the ground. No casual observer could have noticed that anything was going on under the surface. At last the time was ripe for attack, and upon a given sign one group of industry opened hostilities.

No one knowing the circumstances and the handicaps under which industry was laboring could help to admire this silent play, preceding the labor conflict in the metallurgical and mechanical industries of the Ruhr. Its originator was nominally the association of the latter, but the leadership rested with the central organization of German industry.

The latter has two heads, the *Reichsverband der Deutschen Industrie* (National Association of German Industry) and the *Vereinigung der Deutschen Arbeitgeber-Verbände* (Union of German Employers' Associations). Outwardly they differ in that the latter takes care of labor problems only, while the former attends to the business side. Practically, however, they are identical. The employers' association acts as a counterweight to the labor unions, while the National Association is the official representative of German industry, and as such is without equal perhaps in the whole world.

Originated During the War

Rudiments of this industrial organization existed before the War, but the body, as it is now, took its origin during the War when the army leaders found it convenient to deal with one firmly constructed organization built up on the military plan of control of units. It therefore bears a close resemblance to the composition of an army in its structure. So thorough is the organization that it now embraces every manufacturing plant in Germany, from the smallest to the largest. An "unorganized" manufacturer is now almost unthinkable.

All industrial firms in Germany belong to one or more trade associations, according to the variety of their product, to at least the employers' association of trade, and possibly also to sales syndicates and conventions. All these various societies are represented in the National Association of German Industry in one form or another. They form part and parcel of it. This association is therefore of a rather heterogeneous character. The idea was to bring every combine of industrial firms under uniform leadership. If a trade society is of a national character, it is a direct member of the association. Local societies are mostly represented by their territorial or national combine. There are over a thousand societies or combines of societies embodied in the N.A.G.I., 761 directly, 254 indirectly. Amongst them are quite a number of sales syndicates and 67 chambers of commerce and trade. The number of individual firms thus united can only be estimated, as most of them are represented several times, but it is surely not less than 20,000.

It was decidedly no easy task to weld this vast army of diverging elements together, but innate discipline, the storm and stress times of post-war years, the need of a uniform front against the onset of labor and foreign competition, and some gentle pressure from "higher up" have achieved it. Today the National Association of German Industry stands upon solid rock and is a vast power in the state, in business matters ranking next to the high finance and, politically, second only to the labor unions, which have the advantage of a larger number of votes. To reverse the order in the latter respect, was one of the objects of the recent conflict in the Ruhr.

The inner organization of the National Association is naturally somewhat complicated. The rank and file of societies is divided into groups, according to trade and the large groups are again divided into sub-groups. Territorial associations of no clearly expressed character, societies of a general nature and chambers of commerce form special groups. There are 27 trade groups, some of them directed by a head organization, and one for miscellaneous members, 28 all in all. Each branch of industry is therein represented. As an instance the position the machine building industries occupy in the Association may show the structure of it. The trade group machine building comprises 115 trade societies, divided into 13 sub-groups under one head organization, the *Verein Deutscher Maschinenbauanstalten* (Society of German Machine Building Works). All societies have their own manager and each sub-group is presided over by a separate manager. The sub-groups of machine building are the following:

1. Machine tools and tools
2. Textile machinery
3. Agricultural machinery and implements
4. Railroad engines
5. Power generating machinery
6. Auxiliary machinery
7. Machinery for the metallurgical industries
8. Hoisting and conveying machines
9. Machines for the paper industry and the printing trade
10. Machinery for the foodstuff and chemical industry
11. Crushing and oil dressing plant
12. Miscellaneous and parts
13. Instruments and apparatus.

The first group, machine tools, has eight members, the societies of makers of machine tools, dies, woodworking machinery, woodworking tools, grinding tools, measuring

tools, circular saws, and of testing machinery. In the other groups the detail organization is similar.

The business of the National Association is controlled by a board and a group of executives, which, according to German practice, are not members of the board. The board consists of 140 delegates of the trade groups, 30 delegates of local and territorial associations and 30 others, together 200 members. Besides there is the board of executives comprising the president and the managers of 12 departments with their staff of secretaries, all in all no less than 40 salaried employees. The general board maintains 19 committees, devoted to business of various character.

The variety of the business of the associations is immense. There is hardly a gap in anything that pertains to industry. It would almost fill several printed pages, to enumerate the business branches of the association. Only the most important ones may be mentioned by way of illustration: Reparation, Colonial business, press, international trade agreements, taxes, duty, foreign trade, banking, stock exchange business, credit, financing, labor matters, insurance, shipping, labor and general law, tuition of apprentices, trade schools, statistics, advertising, business with Soviet Russia, syndicate and convention policy, foreign law, industrial disarmament, exhibitions and fairs.

Of the 19 committees may be mentioned the German-Russian trade committee, the committee for reorganizing the trade press, the syndicate committee, the committee for watching state note banks and the state budget, and the reparation committee.

Decisions Seldom Disputed

The proudest names of German industry figure in the long list of board and committee members. None of the leaders are missing. This alone explains that the huge army represented in the association subjects willingly to its advices, which often take the form of dictates. The wisdom of its decisions is hardly ever disputed in the manufacturing circles. An exemplary discipline, like in a military body, prevails. The association entertains a very efficient news service. All news of interest to the generality of manufacturers or groups of them is brought before their notice by open or confidential communications. One has never heard that the confidence of such communications, which are often of a delicate nature, has even been abused. Telegraphic and telephonic connection with the ramified organs of the association insures constant and quick contact, even with the most remote outposts. An army leader in his headquarters, issuing orders to his troops, can hardly find quicker service and more ready obedience. The latter perhaps is the chief strength of the association and of the industry it controls.

Helping the Shop Superintendent

By Frederick Kampmeir

THE shop superintendent is often the only person sufficiently well acquainted with the progress of work in a jobbing shop to advise intelligently concerning it. In one such shop the superintendent complained that his effectiveness was considerably hindered because of frequent interruption to answer telephone calls and requests for information, usually coming from the office, concerning various details, shipping dates, estimates as to the time required to do certain jobs, and so forth.

The general manager quickly saw the point, and started a plan which has improved conditions materially. The ruling was made, and notice was posted, that the superintendent would be available in his office to give general information at three periods in the day—9 to 9:15 in the morning, and in the afternoon from 1 to 1:15, and from 4:30 to 4:45. This plan left him free for the remainder of the day to devote his attention to his own problems. The plan has worked out so well in this case that it seems to have application in many other plants where complete scheduling of production is not maintained, and where one man is responsible for many problems.

Draftsman's Error Contest
Discussion

By Charles Sprague Hazard

FRANK KAHN'S interesting account of his "Draftsmen's Error Contest" on page 534, Vol. 69, of the *American Machinist*, presents a particular solution of the problem that bothers every executive—the problem of making the personnel appreciate the importance of exactness in clerical details. Throughout the plant, all those clerical workers who come in contact with the production executives are subjected to pressure to do their work in a hurry, with the result that mistakes are made, mistakes in filling and billing customers' orders, mistakes in production records, mistakes in time tickets and in cost records.

The usual method of training is to wait until some error comes to light, then "bawl out" the guilty party, warn him never to let it happen again, and then go right on pounding him for quick results. We have seen the shipping clerk, for example, get a calling down for some incorrectly checked shipment, and immediately afterward be told that, "these shipments must be out of here by four o'clock." As the "bawling out" comes spasmodically, while the pressure for speed is continuous, the man concentrates on getting his work done on time, rather than with exactitude; and he comes to accept the occasional reprimand as part of his job.

As a preventive of clerical errors, independent checking by a second clerk, such as is sometimes resorted to on shipments or invoices, is expensive, and does not entirely prevent mistakes. On the other hand, teaching each employee how to catch his own mistakes, and training him to take the time to check over, from start to finish, every piece of work that he does, will pay big dividends on the time expended. Most work can be checked over in much less time than was required to do it, particularly when checking has become a habit.

As another preventive of errors, it pays to make a general practice of having each piece of clerical work initialed by the man responsible for its correctness. This is done, not so as to know who is to get the "bawling out" when a mistake is found, but as a part of the general campaign to inculcate in every clerical worker a sense of individual responsibility for the accuracy of the work which passes through his hands.

Every executive in charge of welding operations, no matter how high up in the firm he may be, should familiarize himself with the vital requirements of a good sound weld, and should see to it that these principles are carried out thoroughly by all his workmen.

· BOOK · REVIEWS ·

MATERIALS HANDBOOK. By George S. Brady, associate editor, *American Machinist*. Four hundred twenty-eight pages 4¼x6¾ in. Semi-flexible covers. Published by the McGraw-Hill Book Company, 370 Seventh Ave., New York, N. Y. Price $4.

THIS handbook is intended to fill the need of shop executives, purchasing agents, and foremen for a ready reference on the essential properties and characteristics of the materials employed in manufacturing. With the increasing use of a great variety of alloy steels, special bronzes and brasses, molding compounds, and the entry of entirely new materials into the shop, materials engineering has developed as a new function. As in the case of other handbooks of engineering, this book has brought under one cover the accumulated knowledge of the subject in concise form. It gives the purchasing agent a general knowledge of the materials he must buy for the shop, and it gives the shop man, in turn, essential data on the characteristics of the materials he is handling. The book will also enable the designer to select his materials intelligently; for nearly every subject is cross-indexed or contains sufficient reference to permit a wide survey of the characteristics of available materials.

The book contains descriptions of nearly 1,500 raw materials used in the shop, with data on the chemical contents, weights, melting points, uses, treatments, substitutes, and adulterants. In the case of trade-named alloys the proportions of metals entering the alloy are usually given, and the name of the maker is included. The book is alphabetically arranged, and a group contents is given. In the appendix are given tables of units of measure, conversion factors, temperature conversion scale, a list of the elements with their chief characteristics, and the standard classifications for iron and steel scrap.

INDUSTRIAL EXPLORERS. By Maurice Holland, Director, Division of Engineering and Industrial Research, National Research Council, and Henry F. Pringle. Three hundred forty-seven pages, 5½x8½ in. Cloth board covers. Published by Harper & Brothers, New York. Price $3.

INDUSTRIAL Explorers consists of intimate biographies of nineteen men who have accomplished outstanding things in industrial research. Some of these men are little known, and others well known, to the public. It is a good book for executives to read, dream about, and apply in, perhaps, less spectacular fashion to their own industries. Just such patient, yet well-planned, research as performed by these nineteen men would make itself felt on the balance sheet of many a firm—if properly guided and supported from the top.

It is also a book for the young man who is thinking of science or research as his life work, and for everyone who is interested in knowing about, or being entertained by, the story of how some of the alloy steels came into being (John A. Matthews), how research has improved our coffee (Samuel C. Prescott), how Bakelite was discovered (L. H. Bakeland), and the man who invented our modern searchlights (Elmer A. Sperry). The style of the book is shown by the following chapter headings: "It Won't Break" (E. C. Sullivan and Pyrex), "Atoms in Concrete Form" (F. R. McMillan and cement), and "Science Takes Wings" (William H. Miller and airplanes). These "Industrial Explorers" are all sorts of men from those who are ill at ease whenever science is not the main topic of conversation, to those who are themselves excellent salesmen.

DOLLARS AND SENSE. By Chas. E. Carpenter. Two hundred fifty-six pages, 5x7½ in. Published by Doubleday, Doran & Company, Inc., New York. Price $2.

THIS volume was written to refute the statements and arguments put forth in *Your Money's Worth*, which was reviewed in these columns some time ago. It is written in the breezy style for which the author is well known, and vigorously attacks most of the points made in the other book. While the author has laid himself open to be quoted as being opposed to all standardization, against all specifications, and in favor of anything that "gets by," we do not believe that this is his position regarding his own well-known products. As with all controversial books, both should be read together, and they must be compared and interpreted by the individual reader. The index is novel in its makeup, but does not help the reader to find the references in many cases.

THE AIRPLANE AND ITS ENGINE. By Charles Hugh Chatfield and Charles Fayette Taylor. Three hundred twenty-nine pages, 5½x8 in. Published by the McGraw-Hill Book Company, 370 Seventh Avenue, New York, N. Y. Price $2.50.

THIS volume has been written to fill the gap between the highly technical books on the one hand and the purely popular books on the other, and is intended primarily for the intelligent middle-class readers who desire sound knowledge of the basic facts and theories of the airplane, but who do not need the study necessary to become designing engineers. With this in view the authors have avoided the use of higher mathematics, and have confined themselves to modern planes. No claim has been made for originality, but the information has been well arranged and meets its purpose.

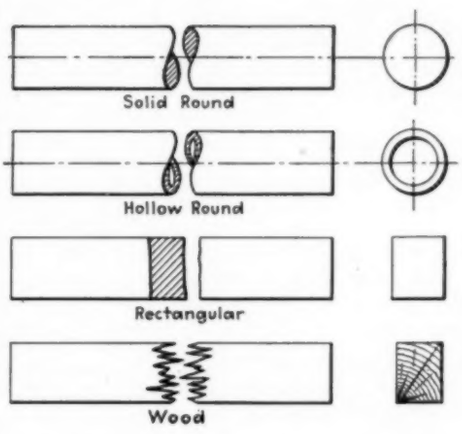
There are seventeen chapters, including such topics as wings, parasite resistance, stability and control, airplane engines, the propellor, construction, seaplane, amphibian, commercial, and military planes and instruments. There seems to be little doubt as to the book filling a need for the average reader who is becoming "air minded."

A BIBLIOGRAPHY ON WOODS OF THE WORLD. Prepared by Major George P. Ahern and Helen K. Newton, of the Tropical Plant Research Foundation, for the A.S.M.E. Special Research Committee. The pamphlet contains seventy-seven 8x10½-in. pages, paper covers. It gives a very complete list of books and magazine articles pertaining to the commercial woods of the world, especially tropical hardwoods. The bibliography is arranged according to authors and also geographically. For quick reference it also contains a complete index of wood names, authors, and sources. Enough general information on each topic is given so that the probable value of the article to the investigator can be judged. The book should be useful to anyone seeking information on lumber products. Copies can be obtained for $1.50 from the American Society of Mechanical Engineers. 29 West 39th St., New York, N. Y.

Drafting Standards for Line Work

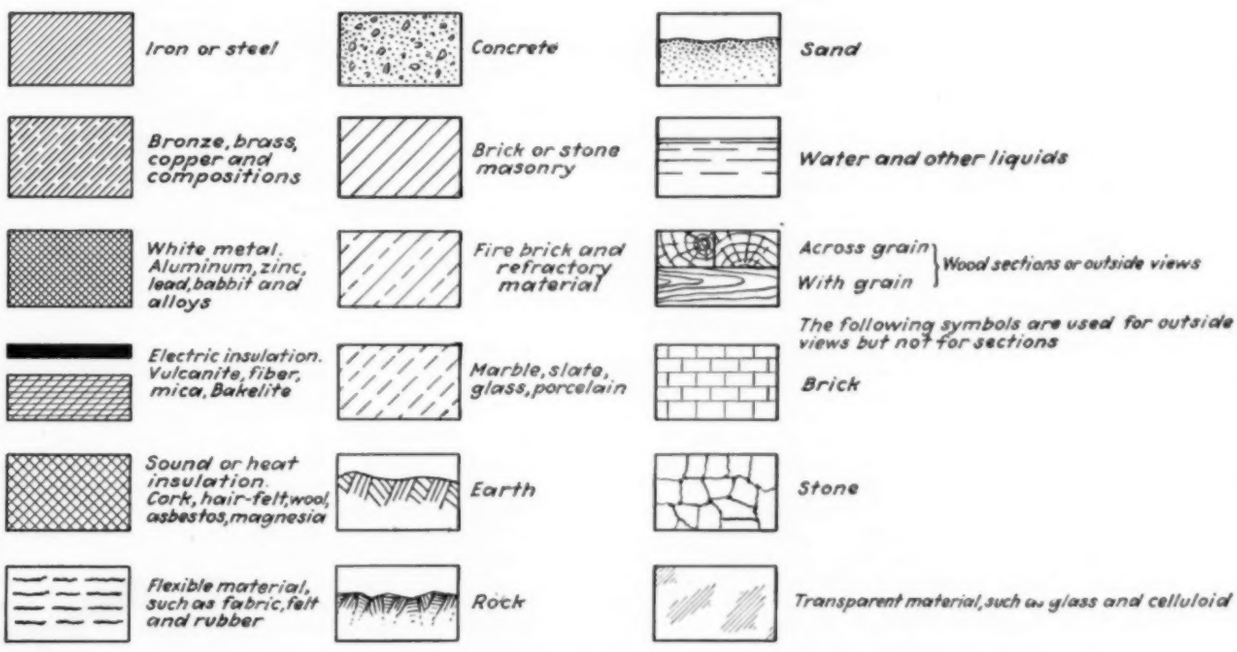
Proposed American Recommended Practice

The actual width of each type of line should be governed by the size of the drawing, the relative widths of the lines to be held approximately as shown to the right. Shafts, rods and tubes, which have a portion of the length broken out, are to be shown by the method given below using the following conventional methods of cross-sectioning for the broken portions



Outline of parts	The outline should be the outstanding feature and the thickness may vary to suit size of drawing
Section lines	Spaced evenly to make a shaded effect
Hidden lines	Short dashes
Center lines	Broken line, made up of long and short dashes, alternately spaced
Dimension and witness lines	$3\frac{1}{2}$ — Lines unbroken, except at dimensions
Cutting plane line	Broken line made up of one long and two short dashes, alternately spaced
Break lines	Free-hand line for short breaks
	Ruled line and free-hand zigzag for long breaks
Adjacent parts and alternate positions	Broken line made up of long dashes

All lines must be dense black to permit of reproduction of the drawing by the various processes. Witness and dimension lines are to be unbroken except by the dimension, and the arrows are to be closed, not open. Show as few "hidden lines" as possible, sections being preferable in many cases


Iron or steel
Concrete
Sand
Bronze, brass, copper and compositions
Brick or stone masonry
Water and other liquids
White metal. Aluminum, zinc, lead, babbit and alloys
Fire brick and refractory material
Across grain
With grain
Wood sections or outside views
Electric insulation. Vulcanite, fiber, mica, Bakelite
Marble, slate, glass, porcelain
The following symbols are used for outside views but not for sections
Brick
Sound or heat insulation. Cork, hair-felt, wool, asbestos, magnesia
Earth
Stone
Flexible material, such as fabric, felt and rubber
Rock
Transparent material, such as glass and celluloid

The above symbols and cross-sections give a conventional method of distinguishing various materials commonly used, but can only indicate the general character and not complete specification of the material of the parts. They permit of sub-division if found desirable, by making minor changes but maintaining the general characteristics. For simplicity on details where the material is named, sections may be shaded or made as for iron or steel

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· TECHNICAL · ABSTRACTS ·

Automotive Brake Design

The following specification was recently recommended for adoption by the Eastern Conference of Motor Vehicle Administrators as summing up the requirements for automotive brakes:

"Every motor vehicle operated in or upon any public highway in this State shall be equipped with brakes adequate to control the movement of and to stop such vehicle. Every automobile so operated shall be equipped with at least two braking systems, with two separate means of application, each operating on at least two wheels and each of which shall suffice to stop the vehicle within a proper distance. If these two systems are connected in any way, they shall be so constructed that failure of any one part of the operating mechanism shall not leave the automobile without brakes on at least two wheels. One of these systems shall be so constructed that it can be set to hold the vehicle. All such brakes shall be maintained in good working order and shall conform to regulations not inconsistent with this act to be promulgated by the Commissioner of Motor Vehicles. Every motorcycle shall be provided with at least one brake which may be operated by hand or foot."

Following is a summary analysis of present American practice with respect to types of brake and their location:

Twenty manufacturers of passenger cars equip a total of 52 different chassis models with four-wheel hydraulic brakes. Of these, 30 (58 per cent) have external brakes on four wheels, operated by foot, whereas 22 (42 per cent) are equipped with internal brakes on four wheels, foot-operated. Fifty of these models (96 per cent) are fitted with external transmission parking brakes, the two remaining models (4 per cent) are equipped with the hand lever operating on internal rear brakes.

Twenty-four manufacturers of passenger cars build a total of 52 different chassis models with four-wheel mechanical brakes. Thirty-two (60 per cent) of the models have internal brakes on four wheels for foot-operation; 14 (27 per cent) have internal front brakes and external rear brakes, foot-operated, whereas the remaining six models (11 per cent) have external brakes on four wheels for foot-operation. Of the 32 models with the foot brakes operating internally on all four wheels, 14 (44 per cent) have internal hand-operated brakes on the rear wheels; 12 (37 per cent) have internal hand-operated brakes on all four wheels; five (16 per cent) have hand-operated external transmission brakes; one model (3 per cent) has external brakes on the rear wheels for hand operation. Regarding parking brakes on the 14 models with foot-operated brakes, external in the rear and internal in front, six (43 per cent) have the hand-lever connected to internal rears, five (36 per cent) are connected to external rears, three (21 per cent) are hand-operated on external transmission brakes. On the six models with external foot brakes on all four wheels, parking brakes are found on the transmissions of four (67 per cent), models and internally mounted on the rear wheels of two models (33 per cent).—John A. C. Warner, *Automotive Industries*, Dec. 8.

Metal Cutting With City Gas

Large consumers of acetylene in torches are potential users of city gas as a substitute fuel. There are, however, various economic factors involved, which necessitate a thorough study before its adoption. Although acetylene has a high flame temperature, high B.t.u. and low oxygen-gas ratio, its cost is high.

The number of torches being operated at one permanent geographical location is a very important factor in the selection of the fuel gas for the reason that, if a large part of the cutting is performed at scattered points, the use of pipe-line distribution of gas cannot be resorted to economically.

Before attempting to substitute some other fuel gas for acetylene, each plant should make the following analysis:

Annual cost of acetylene and volume used;

Source of supply and method of distribution;

Do conditions warrant the installation of acetylene generators?

What is the relative quantity and cost of acetylene used for cutting and for welding?

Annual cost of oxygen and volume used for both cutting and welding;

Present source of supply and method of distribution;

Do economic conditions warrant installation of an oxygen plant?

The following are a few representative questions for which the industrial must find favorable answer before any change in cutting fuel gas is made:

What will be the replacement cost for the available substitute fuel gas?

Requirements for the cutting fuel on the particular operation;

The effect of the substitution on the consumption of oxygen; and its cost;

Under what pressure is substitute gas delivered?

Due to the increased oxygen consumption which is experienced when cutting with city gas, the cost of oxygen per cu.ft. is a vital factor in the ultimate economy. With a consumer-operated plant, the unit cost of oxygen decreases almost proportionately as the load increases. Therefore, the possibility exists that consumers who cannot afford to use city gas because of the prevailing market price of oxygen might install an oxygen plant and realize a two-fold saving—first, on the cost of oxygen direct, and, second, through the use of a cheaper fuel gas.—F. P. Wilson, Jr., *Industrial Gas*, October.

Demonstration of New Equipment and Investigation of Shop Methods

Specialization in different phases of modern production has created a demand for liaison officers capable of understanding and linking up various departments which would otherwise be circumscribed and more or less self-contained. The demonstration and investigation staff act in this capacity between the planning department and production sections. Production should commence, not as is usually supposed when the raw material enters the shops, but immediately the component drawings reach the planning department.

Among the functions of the planning department may be included the analysis of component design from the production point of view, and arranging for any necessary modifications; planning of operation sequences; analysis of operations, etc., to decide necessary equipment; modification of ideal sequence if necessary to utilize existing plant; estimating equipment costs; issuing instructions to equipment drawing office; estimating production times; ordering new plant; inspection of new equipment and installation; demonstration of equipment and processes.

The importance of this function is not stressed as it should be; only in rare instances is it carried through in the proper manner. Frequently the modifications asked for are decided by the possible simplification of equipment, whereas the demonstrator would be interested in many other points, as, for instance, the nature of the material, machinability, etc. Slight alterations in shape or additional machining lugs would often eliminate deflection during cutting, a frequent cause of faulty work. Excellent sequences of jigs are often reduced in utility by the impossibility of producing flat locating faces on the component.

The amount of material to be removed should be determined at this point, and together with the tolerances should be shown on the drawings. Even distribution of machining allowances saves both time and money and gives better results. It is useless to lay out tools with cuts theoretically balanced and then accept castings or stampings which load one tool with $\frac{1}{8}$ in. cut and another with $\frac{1}{2}$ in. cut. The draw allowable on stampings should be indicated, particularly when the job has to be chucked on the taper diameter, and in cases where the taper blends into a radius, the stamping drawing should show a smaller radius, thus preventing excessive loading of the tool for finishing.

In conclusion, the author submits that all demonstrations, whether handled internally or by an outside contractor, should be based on the firm conviction that a square deal is the one absolutely essential thing.—*The Automobile Engineer*, Dec., 1928.

IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Gear Cutting on a Shaper

By Wilfred E. Johnson

There are very many small machine shops that have only the equipment necessary to handle the ordinary repair work to which they cater. At times they are called upon to make or repair gears, and it is my object to describe a method whereby a gear can be repaired, or even, in an emergency, made in a shaper.

Where several teeth have been broken out, welding is usually employed to build up sufficient metal for new

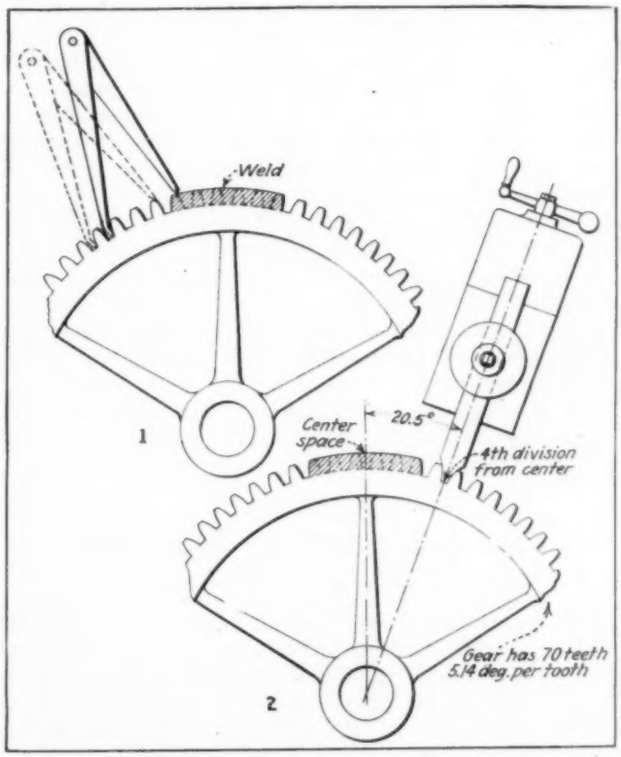


Fig. 1—Laying out teeth with hermaphrodite calipers
Fig. 2—Using the shaper head for indexing

teeth. After this metal has been turned to gear dimensions, the next step is to lay off the teeth. The simplest method is to use a pair of hermaphrodite calipers, as shown in Fig. 1, with the leg resting against the root of one tooth, and the point coinciding with the line of intersection of the face and top of a tooth. The distance between the two legs of the calipers should be greater than the welded space so as to avoid distorted teeth near the weld.

With the calipers set as shown, the different spaces are laid off from each tooth. After the layout from one side has been completed, the calipers are shifted to the same relative positions on the opposite side of the welded part.

Before grinding the tool, it must be determined whether the tooth shape should correspond with those in the gear being repaired, or whether it should be of standard form. Usually, it is better to duplicate the remaining teeth, as otherwise the gear will be noisy when it is put back into service. The usual practice is to grind a tool to fit the space between two teeth that show no signs of strain or undue wear.

The layout marks on the face of the gear may be correct, but a check is advisable, and the following method is used. Assuming the number of teeth to be 70, the angular space between teeth will be 360/70 or 5.14 deg. The gear is set in the shaper vise with the center of the middle space to be cut, approximately in a vertical line, and the shaper toolpost should be at 0 deg. as shown by the graduations on the head.

Assuming that five spaces are to be cut, two on each side of the center, the head is set over far enough to find two normal teeth. Supposing that these occur at the fourth space from the center, the head is shifted over 5.14 x 4 —20.5 deg., nearly. The tool is then shifted about so that it conforms exactly to the contour of the adjacent teeth, as shown in Fig. 2. When it is shifted back to 0 deg. the tool should be central between the two lines of the center space.

After cutting the center space the head is shifted a little more than 5 deg. and the second space cut, then to 10.25 deg. and the third one cut, and then the same on the other side of the center line. If a table is made up, and the approximations made from it, the variations will be negligible on a repair job.

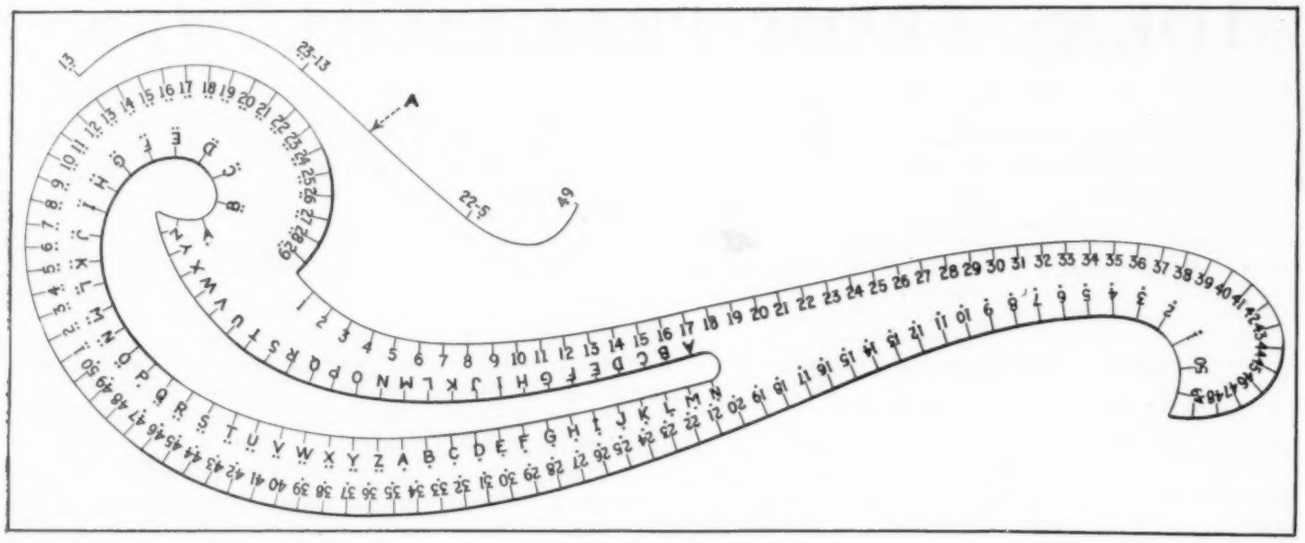
If a new gear is to be cut, the best thing to do is to secure a duplicate gear and press it and the blank on the same mandrel, and index by a stop-pin or by any other convenient method. If no gear is available the method used for repairing may be used, but it is recommended that six accurate settings be made 60 deg. apart. By cutting each way from six center lines, variations will not be cumulative.

A Graduated Irregular Curve

By Joseph E. Fenno

When curved lines are gone over or traced, incorrect outlines or poor joints sometimes result when the draftsman fails to place the celluloid curve in the same position as the previous one. Accuracy is also necessary when duplicating the side of a symmetrical curved figure, for appearance sake, if for no other reason.

The method I use, employing the graduated irregular curve shown in the illustration, is to follow the curve through, jotting down lightly on the drawing, the graduations at the end of each short curve as shown on the



A graduated irregular curve

line *A*. Then, when I ink in, the celluloid curve is placed on the drawing so that markings on drawing and celluloid curve coincide.

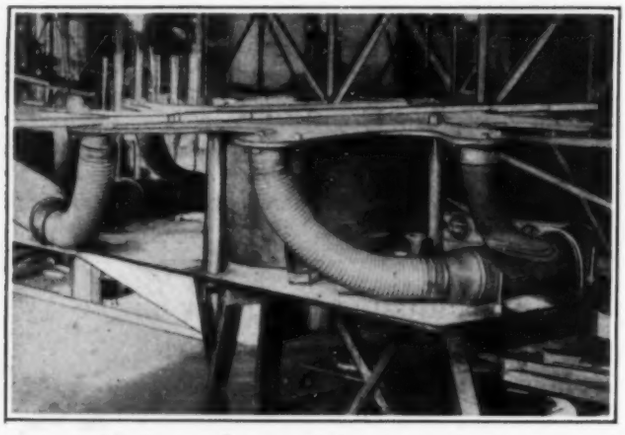
It will be noted that dots are used with both numbers and letters in order to make symbols that will avoid using 3-place figures.

Welding Fixture for Airplane Engine Exhaust Manifold

By D. B. Wedge

The accompanying illustration serves both as an example of the use of welding in airplane work and of the growth of airplane building to the point where fixtures are becoming common practice. This is a fixture for the building up of the exhaust manifolds for the Wasp engine used on the planes of the Metal Aircraft Corporation at Cincinnati, Ohio.

The fixture consists of an upper and lower steel plate mounted on a stand. The lower plate serves as a



Fixture for Welding Exhaust Manifold for Airplane Engines

former, or templet, for holding the curved tubing in its proper position while the outlets are being welded into a unit. The upper connections are of flexible tubing, as can be seen, having a sheet-metal end that is coned to receive the metal pipe beyond. There are four outlets on one side and five on the other, some of the connections being arranged to slip into each other for ease in assembling.

Pins or studs in the lower plate make it easy to locate the manifold, and U-bolts with wing nuts on the lower end hold the pieces in position while being welded. The lower portion of the manifolds are welded up in sections before being assembled to weld on the curved portions that reach up to the cylinder outlets. The fixture is nearly 60 in. in diameter.

The upper, or locating part of the fixture, is laid out with bolt holes that represent the cylinder outlets, and cut out into a nine-pointed, round-ended star to make it lighter and also to give free access to the manifold being welded. The two plates are separated the proper distance both by the outer bolts and sleeves, and by the large central tube. The fixture is a good example of what is being done in modern aircraft work, and contains suggestions that can be modified to suit many similar conditions.

Lamp Brackets for Machines

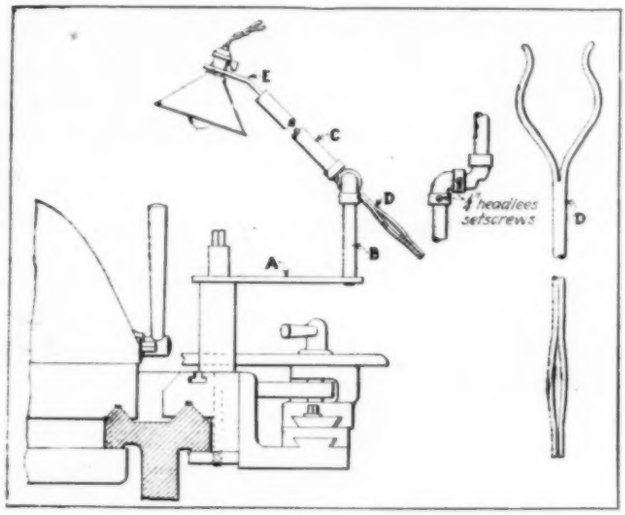
By Wm. S. Rowell

While much has been done to improve machine-shop lighting, there are comparatively few machines that have their individual lamps mounted in such a way as to secure a high degree of efficiency and convenience. Herewith is a sketch of a lamp bracket that has been giving satisfactory service for a long time.

A view from the rear end of the lathe is given, as it more clearly sets forth one of the outstanding advantages, namely, while the bracket is mounted on the carriage so as to travel with the tool, it in nowise interferes with any part of the carriage, taper attachment, or tailstock.

The base column is of such a height that the arm *A* swings clear above the taper-attachment clamp, and it is far enough back not to interfere with the steadyrest. It is held in place by a bolt of proper length, which replaces the carriage clamp-bolt, and which is provided with a square for the toolpost wrench. The cylindrical portion is of sufficient height to allow the free use of the wrench when clamping the carriage, without interfering with the knuckles. The swing arm *A* must be long

enough to allow the wrench to freely clear the upright *B*. It may be made from $\frac{1}{2}$x$\frac{3}{8}$-in. cold-drawn stock and will provide a convenient place for the oil can. Parts *B* and *C* may be made from $\frac{3}{8}$-in. pipe, and the two ells should be extra heavy to provide sufficient thickness of metal



Individual lamp bracket

to hold the two headless setscrews, together with their copper cushions, to supply the needed tension.

The upper ell should be drilled through as shown, to allow greater telescopic action of the rod *D*, or a tee may be used. Rod *D* is split at one end to provide a spring clamp for the lamp, and at the other end to give it the necessary friction in part *C*. It should be bent close to the lamp to permit the lamp to assume various positions when the rod *D* is rotated.

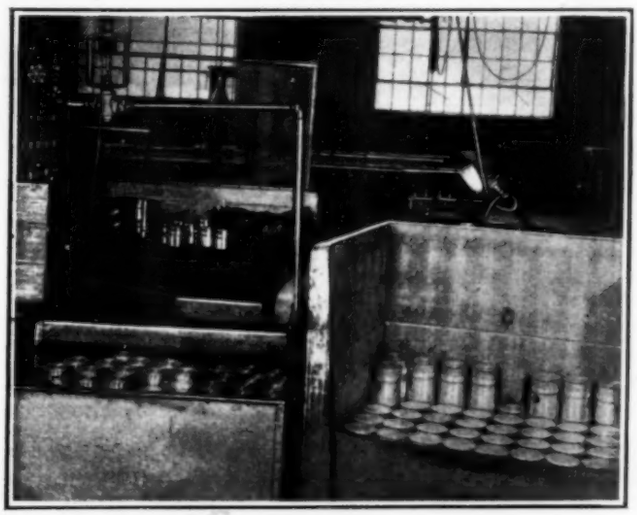
Heating Aluminum Pistons for Assembly

By Frank C. Hudson

Aluminum alloys expand so much more than steel that the use of light pistons involves the fit of piston pins to a marked degree. The expansion of the aluminum piston increases the clearance around the pin as the engine gets hot so that piston pins have to be fitted very close in assembling the pistons and connecting rods. Otherwise the pins will be loose in service.

One method of handling this problem, and perhaps the most convenient, is to heat the pistons before assembly, a hot-water bath being used for the purpose. A convenient method of doing this is shown in the illustration from the plant of the Reo Motor Car Company, at Lansing, Mich. This heating tank is in the assembly line just before the pistons and connecting rods come together. The temperature of the water is controlled by the regulator in the pipe line over the tank.

After heating, the pistons go to the bench at the left where they meet the connecting rods, and the heated pistons enable the assembler to push in a pin that is a very snug fit, even while the piston is hot. This method avoids distortion of the piston from forcing the pin into it, and has proved very satisfactory in practice.

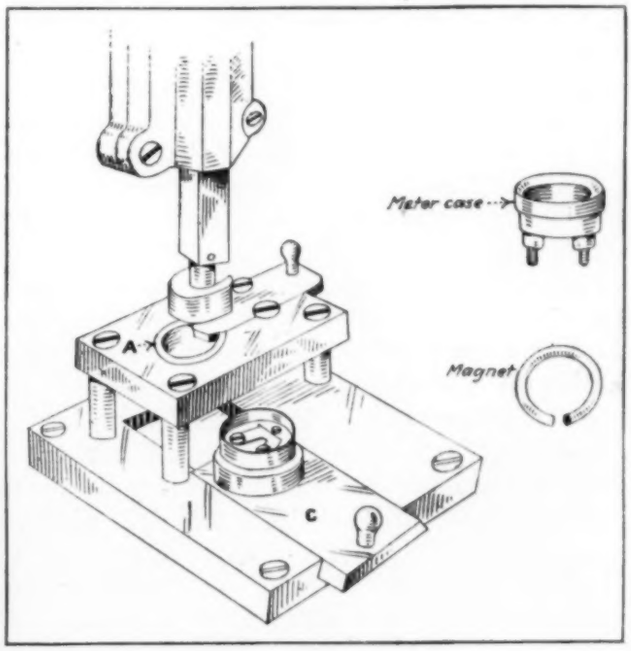


Tank for heating aluminum pistons before assembly

Assembling Magnets in Ammeters

By Charles H. Willey

In assembling the parts of ammeters for the Ford Model A cars, difficulty was encountered in putting the magnets into the cases so that the north and south poles would be in the correct position in regard to the armature. We found that the openings in the magnets, which are of round magnet-steel wire, would vary about $\frac{1}{16}$ in. in the course of manufacture, mostly due to spring dur-



Tools for assembling magnets in ammeter cases

ing the hardening process. This variation was taken care of in putting them into the cases by the press tools shown in the illustration. A magnet is put in the tapered guide hole *A* in the dieblock and the poles are brought into the correct position by bringing the tapered end of the slide into the openings. The case is placed on the slide *C* in the correct position, and is carried under the guide hole by pushing the slide inward against a stop. When the press ram descends, the punch pushes the magnet through the guide hole and into the case.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Beginning Volume 70

WITH this issue the *American Machinist* begins its seventieth volume. Founded more than fifty-one years ago by Horace B. Miller, with Jackson Bailey as its first editor, it has continued under the same name ever since and has been edited by Frank F. Hemenway, Fred J. Miller, Frederick A. Halsey, Leon P. Alford, John H. VanDeventer and Ethan Viall, in that order. The present editorial staff, headed by Kenneth H. Condit and Fred H. Colvin, consists of S. Ashton Hand, George S. Brady, W. E. Irish, Frank W. Curtis, Frank J. Oliver, Jr., W. H. Shipman, Chester B. Lord and H. R. LeGrand.

Modern Equipment Is Only a Part of the Production Picture

MODERN equipment is the central theme around which the complete picture of industrial production is drawn. Without it the picture would be flat and colorless. Likewise, an industrial picture in which the modern equipment is not supplemented by modern methods of plant organiation and administration is a picture with no background, a sketch but not a finished masterpiece.

For many years the *American Machinist* has led in the fight to replace obsolete equipment with the best that has been conceived by engineering brains and built by able production crews, but it has no illusions about the ability of equipment to get results when poorly handled. It is pleasant to relate that real progress has been made in breaking down the old tradition that ancient tools that had been written off the books could compete with modern ones against which a bookkeeping depreciation charge was being made. The tradition is dying hard, but it is yielding.

Now, perhaps, an equally strong effort must be made to prove that only when ideal test conditions have been made the daily routine of production can good equipment achieve the results of which it is capable. For instance, there is a plant, recognized for the excellence of its management, in which a new machine failed to meet its guaranty. A study showed that the new unit had to be fed from the side opposite to that from which the old one was fed. In making the installation this factor had been overlooked and the operator was spending half his time walking around the end of the machine. When the unit was turned end for end production increased forty per cent.

Only an isolated case? Yes, but put enough such cases into one shop and you will soon discover why the best equipment sometimes fails to live up to expectations.

An Appreciation of the Foreman

SCIENCE has adjudged the foreman at the top of the list in intelligence. Behind, in order, come the engineers, the business men, the doctors, the ministers and the college professors. Here is quite a reversal of opinion from the time when the foreman was looked upon as just an unusually good mechanic. Of late he has begun to be recognized as the vitally important point of contact between management and workmen, but never before has he been accorded first place for intelligence. Lest such statements should go to his head it should be remarked that Dr. E. E. Free, the scientist responsible for them, included first-class mechanics, millwrights and riggers in his first intelligence group.

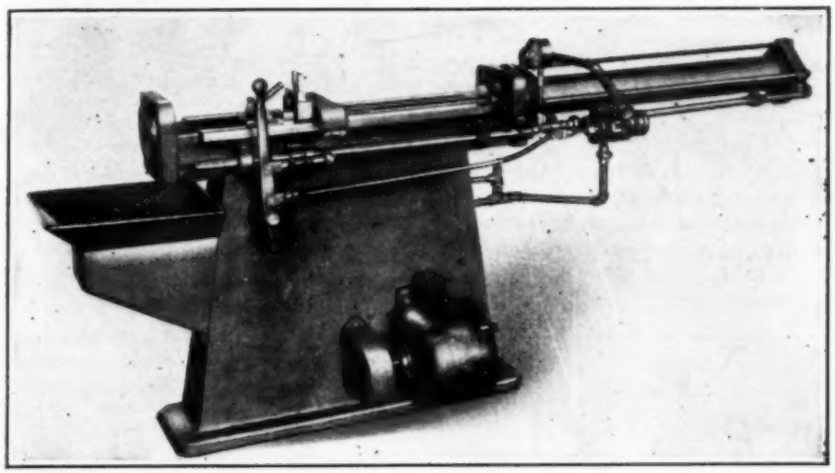
Dr. Free bases his appraisal of intelligence on the ability to reach the correct conclusions from a set of discoverable facts. To anyone who really knows some good foremen Dr. Free's statement will not be so very startling. After all, it is the foreman who finally has to transform plans into action, and to overcome the difficulties that present themselves. He is in the position of the mythical sergeant of the ancient West Point story. A group of cadets were asked how they would erect a large flagpole of specified dimensions on a given parade ground. They went into elaborate calculations, more or less to the point, only to be told that they were all wrong. The well-trained officer would simply say, "Sergeant, put up that flagpole."

It is not surprising that the foreman, through the training of long years of "putting up flagpoles," has reached a high level of intelligence. He had to. The surprising thing is that science has finally discovered his real worth and given him credit for it. With all its vaunted seeking of facts to replace opinions as a basis for theoretical analysis, pure science has not been able to free itself entirely from the attitude of condescension toward the "practical" man that grew up in the days when learning was centered in the priesthood.

· SHOP · EQUIPMENT · NEWS ·

"American" No. 0 Horizontal Hydraulic Broaching Machine

THE American Broach & Machine Company, Ann Arbor, Mich., is now building a No. 0 horizontal hydraulic broaching machine to handle broaches up to 30 in. long. The unit is provided with automatic stops for any desired stroke. The sliding head has a vertical adjustment of 1½ in. either above or below the center. Capacity for pull is 2 tons. The machine is for motor drive only, the pump being driven by a silent chain. Ram movement is controlled by a balanced piston valve, with a relief valve in the line to limit the maximum pressure, which is normally at 350 lb. per square inch.



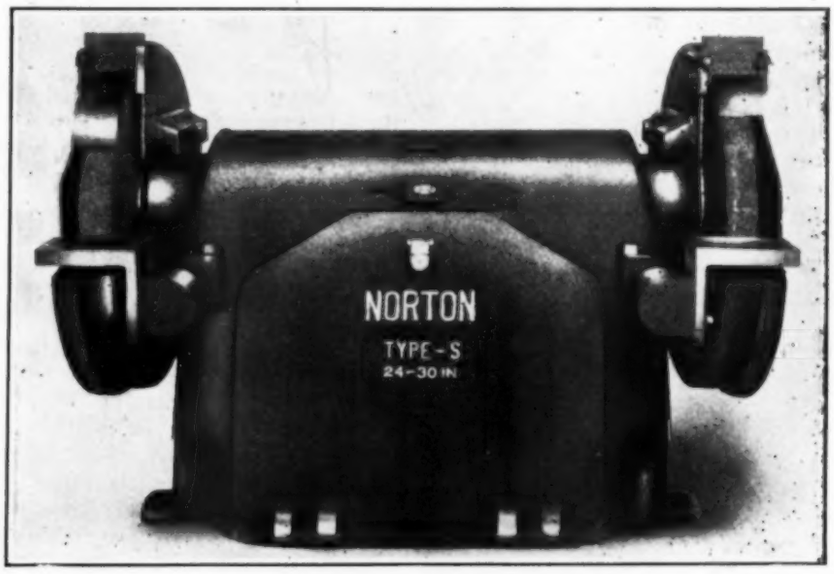
American No. 0 Hydraulic Broaching Machine

The speed of the pulling ram is 18 ft. per min. with the pump driven at 600 r.p.m., but this can be changed to suit the work. A 2-hp., 1,800-r.p.m. motor is recommended. A 5-gal. oil tank is built into the base of the machine, a medium grade of cylinder oil being suggested. The floor space is 4x9 ft. and the approximate weight is 1,400 pounds.

Norton Type S, 24- and 30-Inch Floorstand Grinders

A combination high-speed floorstand grinder that can use either 24- or 30-in. wheels and having a motor mounted in the base, is now built by the Norton Company, Worcester, Mass. Any standard a.c. or d.c. motor can be used. Overlapping protection hoods of ⅜-in. boiler steel insure safety for the operator in accord with the Safety Code for wheels operated at 9,000 f.p.m. The hoods are hinged, and can be adjusted to suit wheel wear by rack and pinion gears and a ratchet wrench. They are locked by a cam and lever movement. The adjustments make it possible to control the degree of wheel exposure. A spark deflector is also furnished.

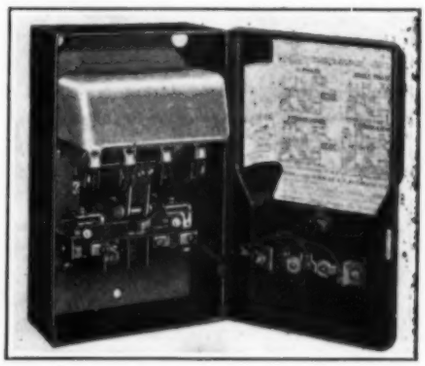
The base is heavy, allows foot room for operators, and provides for a large amount of chips directly under the point of grinding. The spindle is mounted on two double-row ball bearings, and lubrication of the whole machine is by four Alemite connections at the top of the base casting. Optional equipment includes multiple V-belts for three speed changes, or silent chain for constant speed. A 15-hp. motor is specified for 30-in. wheels and a 10-hp. motor when 24 in. wheels are used.



Norton Type S Floorstand Grinder

Allen-Bradley Bulletin 709 Starter

A starter in a redesigned, longer cabinet, and known as the Bulletin 709, has been placed on the market by the Allen-Bradley Company, 286



Allen-Bradley Bulletin 709 Starter

Greenfield Ave., Milwaukee, Wis. No change has been made in the internal mechanism from that described for the former J-1552 Form B starter described on page 230, Vol. 66, of the *American Machinist*. It remains at the same ratings of 5 hp. at 220 volts, and of 7½ hp. at 440 or 550 volts.

The inside length of the Bulletin 709 Starter has been increased 1⅞ in., providing liberal space at both top and bottom of the cabinet for convenient and safe wiring. The starter is furnished in three forms: Form 1 with push buttons in the cover, Form 2 for remote control, and Form 3 with lever switch for automatic or manual control.

"Berjo" Machine and Bench Vises

For use in holding pieces of irregular shape the vise illustrated, known as the "Berjo" vise, has been put on the market by the Avey Drilling Machine Co., Cincinnati, Ohio. It is made either as a bench vise or as a machine vise.

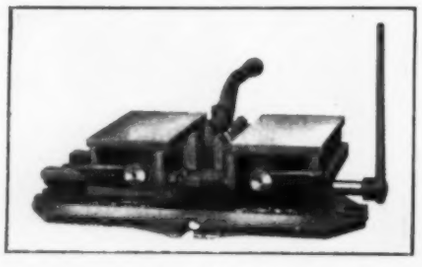
The vise has two jaw carriers, one fixed and the other movable. The jaws themselves are narrow steel plates that slide in and out in the carrier. The space back of the jaws is filled with steel balls that act much like a fluid when pressure is applied and thus permit the jaws to assume the shape of the piece to be held.

Movement of the carriers does not change the contour taken by the jaws, but the jaws can be brought back into line, after the vise is released, by the levers shown on the side of each carrier.

The machine vises will be made in three sizes with maximum openings between the jaws of 4, 6 and 9 in., respectively. The widths are 3, 4 and 6 in., and the depths of opening $1\frac{11}{16}$, $1\frac{15}{16}$ and $2\frac{7}{16}$ in., respectively.

Of the two sizes of bench vise to be made, one has a jaw opening of 4 in., a width of 7 in. and a depth of opening of $1\frac{11}{16}$ in. The other one has corresponding dimensions of 6, 8 and $1\frac{15}{16}$ in., respectively.

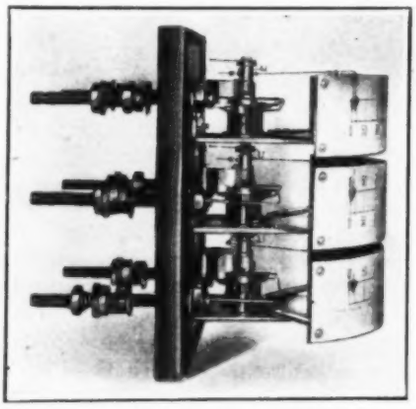
The 6-in. machine vise is now on the market and the others will be ready shortly.



"Berjo" Machine Vise shown gripping a piece of irregular shape

Roller-Smith, Type HEA-3, Polyphase Ammeter

This 3-phase ammeter has been placed on the market by the Roller-Smith Company, 233 Broadway, New York, N. Y. Readings of the current for each of the three phases can be taken simultaneously, and with this arrangement it is possible for the observer to determine whether or not the phases are properly balanced. The scale is 7⅛ in. long, and permits easy visibility. A feature of the instrument is the small space occupied. The secondary coils are rated at 5 amp., and transformers are used with the instrument to give readings on the scale, suitable for the work in hand.



Roller-Smith, Type HEA-3, Polyphase Ammeter

Pollard Die or Tool Truck

Heavy dies or tools can be moved about the shop on this truck, which has been placed on the market by the Pollard Bros. Manufacturing Company, Irving Park Station, 4037 North Tripp Ave., Chicago, Ill. The average height from the floor to the bolster plate of punch presses is approximately 35 in., and therefore this truck was designed to have this height. The trays have sufficient strength to carry loads up to 800 lb. They are fastened to the posts by means of two rivets. The casters used are of steel, and have three rows of ball bearings in the swivel, and a take-up for wear. The semi-steel wheels are turned and mounted on roller bearings, the forks being of heavy steel plate. The diameter of the wheels is 5 inches.

Pollard Die or Tool Truck

Trade Publications

FOUNDRY MIXTURES. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has published a pamphlet entitled, "Twelve Practical Foundry Mixtures," which gives the limits and characteristics of each type of cast iron. In all of these formulas, nickel plays an important part in obtaining the desired qualities.

INDUCTION MOTORS. The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has published Bulletin 1087-E on large polyphase induction motors. The mechanical construction of the types "AN" and "ANY" motors is presented, many photographs being used to illustrate the text. Control apparatus used, installations, and various applications supply the balance of the catalog, which contains fourteen, 11x8½-in. pages.

WASH FOUNTAINS. The Bradley Washfountain Company, 2203 Michigan St., Milwaukee, Wis., has published catalog No. 1028, entitled "Modern Washroom Requirements," which illustrates and describes the complete improved line of Bradley washfountains for sanitary group washing in industrial plants. The catalog also contains numerous photographs of installations and diagrams of suggested layouts.

News of the Week

Swope Regards Outlook in Industry Favorable

The electrical manufacturing business for 1928, on the whole, has been quite satisfactory, with an increase in volume of about 7 per cent, according to Gerard Swope, president of the General Electric Co. The use of electric current in the homes and in the factories continued its high rate of increase, the 1928 rate of increase being about 8 per cent. He believes that electric energy consumption is becoming one of the best indices of general and industrial conditions in America.

Basic economic conditions are all sound, inventories not unduly expanded, credits and collections satisfactory, earnings of labor are high, and employment steady, all of which presage a favorable outlook for 1929, according to Mr. Swope. The year 1928 exceeded all previous years in the volume of production of electric equipment by the company.

Progress Seen in Foreign and Domestic Trade

Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, Department of Commerce, in a résumé of business in 1928 states that the year closed with domestic business larger than ever before and foreign trade in exceptional volume. There is every indication that the high level reached in recent months will be maintained in 1929. He attributes our present prosperity to the automotive and construction industries whose activity has increased the demand for many related products such as steel, cement, rubber and petroleum. Wages continue at a high level, unemployment in general has been reduced to a minimum and factory employment has increased for the first time in a number of years, particularly in the automobile, steel, petroleum and nonferrous industries.

Dr. Klein finds that our exports of merchandise increased about 3 per cent in 1928. The chief commodity exported was automobiles, the export of which were about 70 per cent greater than in 1922 and about 25 per cent larger than for last year. A steady growth in semi-manufactured exports is also noted. As regards distribution, exports to all continents except Oceania increased in 1928. Exports to Canada, now our leading consumer, increased 8 per cent, while exports to South America also steadily increased, being now double the value of 1922 exports.

Further data on foreign trade are given in a bulletin, "Our World Trade," issued recently by the Chamber of Commerce of the United States. In comparing exports in the first nine months of 1928 with the average of the same periods between 1922 and 1927, the chamber finds that exports on the whole were 8 per cent above the average, and that exports of finished manufactures gained 25 per cent; automotive exports gained 77 per cent over the average, industrial machinery 72 per cent and agricultural machinery 54 per cent. The same bulletin shows that exports of power-driven, metal-working machinery in the nine-month period gained 38 per cent in value compared with the same period in 1927. Construction and conveying machinery gained 24 per cent in value. On the basis of units exported, cylindrical grinders gained 44 per cent, lathes 62 per cent, and milling machines 77 per cent.

Have We Unemployment?

While the Department of Commerce, through Dr. Julius Klein, states that unemployment is on the decrease, many speakers at the annual meeting of the American Association for Labor Legislation, held recently in Chicago, stressed the point that though productive efficiency is great, output large and wages high, many people are out of work and the number of unemployed is large. The man without a job cannot get work and his situation is not in the least bettered by the fact that his neighbor, with a good job, is being well paid. The condition diagnosed was regarded as perplexing and anomalous.

Prof. Sumner H. Slichter, Cornell University, one of the speakers, described a major shift in American industry when he said that factory workers had decreased in number by 8 per cent from 1919 to 1927, and that railroad employees had decreased 15 per cent during the same period. In all, a million persons had left these lines of work.

Where have the workers from factories and railroads gone? Many have been absorbed, said Prof. Slichter, by the building trades, hotels, clerical work, the distributive occupations, especially automobile filling stations, and the repair trades, especially the servicing of automobiles and radios. He remarked that the number of unemployed in this country today has been variously estimated at from 700,000 to 3,000,000, and that "I am inclined to believe that 700,000 is nearer the truth than 3,000,000."

But what do available figures indicate?

Employment Statistics Are Noteworthy

Now let the statistics speak for themselves: According to the Bureau of Labor Statistics, of the U. S. Department of Labor, the weighted index of employment in manufacturing industries for October was 88.1, an increase of 1 per cent over the figure for the previous month. Par, 100, is the average monthly employment during 1923, and it has not been reached since that time. There has been a slow, but steady, increase since July, 1928, however. There have been some startling increases in certain metal-working lines compared with October a year ago. In the machine tool industry, for example, the number of persons on the pay roll has increased 22.2 per cent, and the amount of pay roll 35.3 per cent. During the same period, the number employed in foundries and machine shops rose 6.3 per cent; in automobile plants, 38.6 per cent; and in agricultural implement manufacturing plants, 22.8 per cent. The largest drop in employment in the metal-working trade occurred in the shipbuilding industry, a loss of 13.4 per cent being noted. Employment in railway car building plants also fell about 7 per cent.

Incidentally, the General Electric Co., Schnectady, reports 24,500 workers on its pay rolls, the largest number since the War.

And from Detroit comes the news that Ford is to put on 30,000 more men and to work the plants on a six-day basis, while maintaining a five-day week for workers, in order to increase production by 20 per cent.

While the tonnage of ships built in the United States fell markedly in 1928, the outlook for new construction in 1929 is very encouraging, according to *Marine Engineering and Shipping Age*, so that an increase in employment should take place in this basic industry.

A. T. Simonds Sounds a Note of Warning

The increase in commercial money rates in 1928, due chiefly to the demands for funds for stock market speculation, is likely to be followed by a recession or a real depression in business, says Alvin T. Simonds, president of the Simonds Saw and Steel Co. and well known writer on economic questions. He states that the question is going to arise as to how far business men, or

those actually engaged in industrial production, are responsible for this speculation and its consequent dangerous condition. High rates for call money has been the temptation, and a very considerable part of the funds for speculation has come from industrial organizations to be loaned on call. Used in this way, says Mr. Simonds, the funds have earned more for the time than if they had been invested in securities. But the extra dollars gained in this way may be overbalanced by losses in the earnings of the organizations in 1929 and 1930. Some of the industrial leaders, according to Mr. Simonds, have announced that the old economic laws have been laid on the table, and their announcement has been received with enthusiastic applause by the pools playing for the rise and by the lambs ready for the fleecing. But he states that these same industrial leaders will sometime in the future be held at least partly responsible for any unfavorable results that may follow the speculative orgy of the past year.

Depression May Be Due

Analyzing the present in view of the past, Mr. Simonds shows that increasing money rates are followed by decreasing production, and that the trend in production does not change in direction until about a year after a change in direction of the trend in money rates. Business is conducted to a very great extent on credit, and therefore the rise of 37½ per cent in the cost of commercial loans from January to October, 1928, is a jarring blow to industry. He says that this is the first year since 1920 in which the building index has been lower for November than for October, and that it is the first year since 1923 in which unfilled steel orders at the end of November has been less than at the end of October. If, announces Mr. Simonds, on the eleventh of January it is found that the building index has declined from the 98 of November, and the unfilled steel orders at the end of November have tons at the end of November, it will be the time for us all to wake up and try to prove that American business can circumvent the business cycle. It will also be time for the government to call for bids for government construction if any is being held in abeyance for the purpose of preventing business depression.

The Railroads Are Buying Rolling Stock

On top of the news printed last week in regard to the purchase of freight cars in large quantities by some of the leading railroads, among them the Pennsylvania System, comes the report that the Interstate Commerce Commission has just granted the New York, New Haven & Hartford Railroad Co. authority to assume the obligation for $2,600,000 worth of trust certificates in order to purchase rolling stock to the extent of 1,756 cars, including 1,591 steel-underframe box cars. The New England Car Co. is to act as vendor and will procure the equipment from the car builders. A total expenditure of almost $3,500,000 is anticipated. Of course these signs are all favorable to the car builders, but in a secondary way they represent future business for the shop equipment builders who have been finding this class of buyer rather inactive in the past year. The news also reflects the fact that the roads are beginning to spend some money, now that earnings have reached a satisfactory level.

Another Factor

There is another factor in the railroad situation that must be taken into account, judging from a recent statement of the American Railway Association to the effect that the performance of the carriers of the country in the past year had been marked by the greatest operating efficiency and economy ever attained and had resulted in the highest type of service at the same time, despite reduced traffic during the first ten months. Fewer trains and locomotives in proportion to the amount of traffic were used; the average load per train was higher; the distance traveled each day by freight cars was 20 per cent over that for cars in 1923; and freight traffic was handled with the greatest conservation of fuel in the history of the roads. Only $215,000,000 worth of new equipment was bought in 1928 as compared with $288,700,000 the year before, and much fewer locomotives and freight cars were installed during the year. In fact, there were almost 9 per cent less locomotives owned in 1928 than in 1923, but the average tractive power increased over 11 per cent. This means that more powerful locomotives are being used for longer hauls and for longer periods between repairs, and this condition is one of the factors that has resulted in the lessening of machine tool purchases by the roads in recent years.

And Furthermore

Since the above was written, the New York Central has announced the purchase of 100 heavy freight locomotives from the American Locomotive Co., at a cost of about $9,000,000, this being the largest single purchase made by any railroad since early 1926. This road also ordered 100 gondola cars from the Merchants Dispatch.

The Louisville & Nashville at the same time has placed a contract for a total of 2,500 freight cars from three car manufacturers.

The Illinois Central R.R. has authorized the purchase of 15 switching locomotives and over 2,700 freight cars of various types.

The Chicago & Northwestern R.R. is inquiring for 2,000 cars.

The Virginian has ordered 500 hopper cars from the Virginia Bridge & Iron Company.

Mergers Apparently Are Profitable

Stockholders of the Houdaille Corporation, the Hersey Corporation and the Oakes Products Corporation, all manufacturers of automobile equipment, have been asked to vote upon the formal merger of the three concerns under the name, Houdaille-Hersey Corporation. The companies are already under a single management, headed by Claire L. Barnes, president. In a recent letter to the stockholders, Mr. Barnes estimated that the net earnings for the year ending Dec. 31, 1928, of the consolidated companies would be about $2,400,000 after federal taxes, equivalent to over $13 per share on the class A stock.

Record Automobile Output Attained in 1928

With an estimated production of 300,000 cars and trucks in December, the total output for the year 1928 will be brought to about 4,650,000 units, an increase of 150,000 over the former record established in 1926, according to *Automotive Industries*. Production in 1927 was lower than the new record by almost a million. Only a few plants will be closed for inventory this season, and most of them will soon be speeding up after a slight lull during the holidays.

Germany Enlarges Export of Machinery to France

The possibility of increased exports of German machine tools to France seems to be indicated by the complete French statistics of imports and exports for the first six months of 1928. Taking all classes of machinery and tools imported from Germany the increase from 1926 to 1928 was more than 60 per cent. The point and the percentage are significant, according to the Paris Correspondent of the *American Machinist*.

Imports from Great Britain may be left out of the question; the real progress has been made on the side of Germany. This, it may be taken for granted, has cut in on American business in France more than it has on trade with Great Britain.

The duties collected by France on machinery and tools entering the country during the past three years have been as follows for the first six months of the respective years:

	1926	1927	1928
	Value in Francs		
Machines and parts	77,162,000	81,264,000	99,113,000
Tools and other manufactures of metal	26,763,000	28,406,000	38,215,000

Imports of the latter classification from Germany were respectively valued in francs at:

30,412,000	29,825,000	47,193,000

Their bulk in metric quintals was:

31,359	42,562	61,232

In two years the average monthly imports from Germany virtually doubled, the value likewise. On the same items, as per the French figures, there was a falling off from the United States of approximately 40 per cent. Doubtless a five-year average would show different proportions but the fact is patent that at the moment Germany is making headway.

A curious commentary is to be made in observing that the 1927 valuation seemingly indicates imports of a low unit valuation, whereas in 1928 the proportion of value to weight swings violently upward, indicating that a higher grade product from Germany is now coming into France.

Still more curious is the showing in the same classification of French exports to Germany.

	1926	1927	1928
Values in francs	158,456,000	119,590,000	107,676,000

These figures appear extraordinary but they are from official French sources. They show moreover that exports of such items to Germany are from two to three times in value of what they were for the same periods to the United States.

Imports from U. S.

Quantities and values imported by France from the United States for the first six months of the years in question are as follows:

		Metric Quintals	Value, Francs
Machinery and parts....	1926	319,889	320,801,000
	1927	128,454	164,650,000
	1928	67,724	171,508,000
Tools and other manufacturers of metal.....	1926	21,670	51,074,000
	1927	14,290	27,041,600
	1928	13,158	30,518,000

It is obvious that the volume of such exports for the year 1928 will show a decline over the previous one.

British Industrial Outlook Less Rosy

By Our London Correspondent

ON THE whole, the business position in Great Britain remains pretty well unchanged, and while some figures would certainly suggest improvement, certain statistics point in the other direction. For the time being the voice of the prophet has been stilled and the would-be publicist, who with forced optimism has endeavored to encourage us, has given up indicating the numerous corners we have turned or the several woods from which we have emerged.

The number of unemployed, though fluctuating considerably, is still markedly higher than a year ago. On the other hand the value of exports taken over the year has increased and the improvement may amount to something like 2 per cent, while imports have decreased by an amount which, taken over the year, will probably exceed 1.5 per cent. Re-exports, that is exports of foreign produce, have declined somewhat less proportionately. Consequently, the total overseas trading for the year, including of course the three categories mentioned, will probably show a definite decline of the order of 7 million pounds or so, this condition arising from the preponderance of imports as compared with exports. The adverse balance, as it is called, on the year's overseas trading will probably exhibit a definite decline, perhaps 30 million pounds as compared with last year, and a much larger decline as compared with 1926.

Unless a definite change occurs in the last few days of the year, a decline will be indicated in the imports of manufactured articles, and this condition is more than accounted for by the drop in iron and steel. The class known officially as machinery will show an increase. In exports a considerable expansion in the value of manufactures will be seen, led by a large increase in the vehicle class (which includes locomotives, ships and aircraft), followed by machinery, though in electrical goods a slight set-back may be noted.

In the industrial field, the tragic position of coal mining in certain areas stands out, even as compared with other basic industries, like iron and steel and textiles. Since the beginning of 1927, 540 British coal fields, normally employing more than 34,000 people, have been abandoned. For a long period, between 200,000 and 300,000 would-be workers in the coal fields have been unemployed, and the total number of people, including children, who are involved, must approach a million. The effects are far-reaching and relief schemes of all kinds have been inaugurated and organized; but something more is needed. The truth of the maxim that we are all members, one of another, is demonstrated quite clearly in the case of a well-known London store which, interested in subsidiary companies that depend on the popular payment-by-instalment system, has had to pass its dividend and has suffered loss in the public valuation of its shares. The payment-by-instalment system seems to be undergoing a particularly severe trial in South Wales and other mining areas.

Machine Tool Industry Improves

The machine tool industry ends the year in no worse condition than at the beginning; in fact conditions have undoubtedly improved. Certainly the value of exported machine tools has risen, and for the year as a whole, will probably be nearly 2 million pounds. There is no change in the chief home sources of demand, which are still the automobile industry and the electric engineering industry. The latter continues, as it has for a considerable time, to be well occupied, and it is expected that during the next six months the Central Electricity Board will place orders for about 3 million pounds' worth of equipment. In the home market electrical engineering firms have very powerful protection in the sentiment that, with the prevailing unemployment, work must not be given out of the country. Prices sometimes seem to reflect this very clearly. But the case is different when firms have to tender for overseas work and complaint is still made of the low prices obtainable.

A minor branch of the industry, the radio, has during the past few months had quite an unexpected revival, as shown by the number of listeners' licenses taken out, and retailers of wireless apparatus have been limited in deliveries.

The automobile industry, the other chief customer of the machine tool industry, is in a rather less happy condition than had been hoped, though some reports on the present prevailing conditions have tended towards optimism. It has for some time generally been known that certain firms making popular-priced cars sold during the past season fewer than early optimistic estimates had suggested as likely, and in particular have exported less: the fact has been made quite evident in some of the balance sheets and annual reports recently issued. With the arrival of the new Ford company, now definitely formed, the industry may experience increasingly strenuous competition.

Ford Activity in England

For many months rumors, more or less authoritative, have been in the air and on paper, crediting the Ford organization with the intention of building new works in more than one English district. Now it has been definitely announced that the new company will build on a 300-acre site at Dagenham, to the east of the London area, a factory which, according to the company prospectus, will be the largest in the world outside the United States. The factory will take about three years to build. Its capacity will be 200,000 cars per annum. This is really only a little less than the present total annual output of the British automobile industry. But, of course, the intention is not to manufacture solely for this country, as the company will export to the whole of the continent of Europe, except Russia, and to areas in the Near East.

The new competition is being met to some extent by amalgamations of existing firms: a few have already been definitely announced while others as yet are no more than rumor. The latter remark applies also to certain large iron and steel combinations; here one merger suggested would have a total share capital of 22½ million pounds.

The railway position may not have improved, but the volume of road-borne goods has increased steadily. A report on a recent census showed that on eight roads running from Liverpool the daily load of goods had risen to 9,326,000 tons, as compared with the pre-war level of 884,000 tons.

BUSINESS BAROMETER . . . . *Pessimism being unfashionable and there being no real reason to expect reverses, forecasts for 1929 will be optimistic*

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

THIS year's Christmas expenditure in the United States and in Canada is estimated at five billion dollars. This is in addition to the ordinary expenditure for necessaries or essential luxuries, which probably aggregates another five billion dollars.

It is not pretended that these figures are more than intelligent guesses, but the savings of the so-called "Christmas Clubs" in 1928 amounted to over $550,000,000, and when the bonuses and money gifts that were distributed at Christmas time are included, it does not seem at all unreasonable to assume that the people of the United States and Canada spent at least five billion dollars on holiday gifts during December.

Canada is included in this estimate because the trade whch flows back and forth across the international boundary is rapidly increasing, and it is difficult to segregate it statistically. The retail business of both countries is roughly estimated at sixty billions per annum, and in the light of the above figures it seems probable that December accounts for about one sixth of this total.

Under the stimulus of this enormous turnover, the month has been one of great activity, and some let-down is to be expected in January. But there is nothing to indicate any unusual recession, and upon the eve of the New Year everyone seems to be hopeful of the future.

During the next few days many reviews and forecasts will be published. That most of them will be optimistic may be taken for granted. Pessimism is unfashionable, and it is questionable whether those whose views are worth having ought to take the risk of unsettling confidence by prophesying a reaction of which they cannot be certain. Moreover, it should be remembered that those executives who are now in control of America's business policies are upon the average, about forty years old, and that a man of forty can have but little more than an historical knowledge of pre-war conditions.

Therefore we are in a new era insofar as the experience of those who are in charge of America's economic policies is concerned, and the advent of this new era has been so vociferously proclaimed that there are few who are willing to deny its existence. Hence the stock market continues to express confidence in the future despite the high rates at which call money has ruled, and the re-distribution of security holdings that is evident in some directions.

The hope that credit will be more abundant and cheaper after the New Year is still encouraged by many financial authorities, and the extraordinary margins, upon which stock brokers have insisted, have made the market less vulnerable than usual to the influence of what is regarded as temporarily tight money.

There is, however, one feature of the situation that warrants cautionary comment. It is the apparent immobility of the price level for staple commodities. Lincoln said that no nation could be half free and half slave, and most of those whose opinions are worth having agree that the staples of human consumption must soon advance if the rise in security values is to continue.

It is argued, and with reason, that the prosperity of the corporations whose stocks are going up must soon be reflected in higher wages, and that the result will be higher prices for the things for which the wages earned are spent. If this hypothesis be correct, an advance in agricultural products should soon be seen.

Most of our industries are working at or near capacity. There seems to be little or no difficulty in disposing of their output at full prices, and the effect upon the prices of the raw materials that they require ought to be stimulating.

The commodity markets were all quiet last week, and values showed but little change. The fluctuations have not been sufficiently important to disturb the distributive flow. From the standpoint of those who believe in stabilization, this is, of course, desirable, but it is abnormal, and unless there is a bad break in the stock market, an early renewal of activity on the commodity exchanges would seem to be indicated.

The present Congress adjourned over the holidays, and as its policy seems to be one of procrastination, business men have ceased to fear that it will pass any disturbing legislation before it expires by limitation on March 4.

Therefore, the political outlook is one of comparative tranquility, and the same thing may be said of Europe. The improvement in King George's condition has dissipated the gloom that hung over the London stock market, and increased activity is expected after New Year's. There have been no new political developments on the continent, and insofar as economic conditions are concerned, the outlook appears to be satisfactory.

The darkest spot on the world's map is China. Press dispatches indicate that millions of Chinese face the possibility of death by starvation. There seems to be a sufficiency of food, but its distribution is hampered by the lack of transportation, and it is to be hoped that prosperous America will soon address itself to the problem of relieving what appears to be a most distressful situation. No better way of employing our surplus profits or genius for organization could be found, and the need of immediate action is commended to those who direct America's altruistic energies.

WITH one exception, the South, every important industrial center in the country reports that the year just passed has been the most active since the War in regard to sales of machine tools and industrial machinery. Manufacturers end the year with a record volume of unfilled orders on hand. In fact, in the face of insistent demand the problem of deliveries is a serious one. Most dealers and manufacturers believe that the wave of buying which began in December, 1927, and rose steadily ever since will continue for at least six months.

AUTOMOTIVE activity, without a doubt, was the largest contributor of orders to the tool builders, either directly or indirectly, since a large amount of parts orders were "farmed out." Next in importance was the youthful aeronautical industry, which has grown so rapidly in the past year. Engine builders, particularly, were large buyers of production equipment, and it is probable that they will continue to be a factor in the market for some time to come.

MANUFACTURERS of radio sets were also a factor in the machine tool market in more than one center, such as Indianapolis. In Chicago, as would be expected, agricultural implement and tractor builders were the chief buyers. Purchases by railroads, there, as elsewhere in the United States, were below normal for the third consecutive year. Railroad purchases of rails and rolling stock have been one of the major factors, however, in sustaining metal-working activity in Canada.

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The Industrial Review

The year's progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CHICAGO

The few days still remaining before the advent of the year 1929 are replete with activity in the machine tool industry, and this year will close with such a situation as has not been witnessed since the War. Not only that: The prospects for a continuation of the flood of business which for the last five or six months has taxed the productive capacity of tool building plants to their utmost is more than probable, according to executives and representatives of leading machine tool interests.

Interviews with several machinery men, manufacturers' representatives, and large distributors and dealers, with respect to the business of this year disclose the fact that the total volume of trade has exceeded that of any year since 1918. The percentage of increase noted in 1928 over 1927 is variously estimated, but a fair average would make it about 40 per cent. The secretary of one concern prominent as a distributor and dealer in standard shop equipment stated that the business of his house to date would show a 69 per cent increase over last year.

Agricultural implement and tractor builders have easily led in buying during the year, automotive manufacturers coming next, and after that auto accessories, general industry and radio. Railroad buying has not been an important factor at any time during the year.

There is a unanimity of expression with respect to business prospects for the year 1929. A consensus of opinion regarding the first six months of the year is to the effect that the volume of trade will not fall short of that of the half year now ending. There are some who incline to the belief that it will exceed that of the last six months, but they are in the minority. The same manufacturing interests that have produced such a prosperous condition in the machine tool industry in 1928 are expected to maintain their respective positions as buyers in 1929, with, perhaps, an increased demand for shop equipment coming from tractor builders who contemplate enlarging their plants. Not a great deal is looked for from the railroads, however. Optimism is the prevailing note with regard to a continuation of prosperity in the machine tool industry for an indefinite period.

MILWAUKEE

With the majority of manufacturers of metal-working equipment entering the new year with the heaviest production schedules and the largest payrolls in their experience, and the outlook for new business one of rich promise, sentiment in the industry is soundly optimistic. In view of developments, comments made a year ago on the outlook appear surprisingly conservative, for most shops actually did more business in the first nine months of 1928 than in all of 1927, while the expectancy was for a year approximately equalling 1927. If business in 1929 develops a volume only equal to that of the year just closed, most makers say they would be satisfied, yet indications are that it will be larger.

One maker of milling machines in Milwaukee enlarged capacity twice during the past year, and despite this and the almost uninterrupted employment of overtime schedules and night shifts, entered the new year with the largest volume of unfilled orders on any corresponding date. A large builder of turret lathes, balancing machines and other precision tools at Madison, Wis., finds 1928 business representing an increase of more than 85 per cent over 1927. Its foreign business, representing about 12 per cent of the total, increased fully 25 per cent. While these are perhaps to be considered more or less outstanding instances, the excellent character of demand has been felt by practically all builders, not only in Milwaukee but in other shops throughout Wisconsin.

The past demand and prospective call for tools by the automobile and agricultural machinery industries form the basis of healthy optimism, but it is the growth of the aircraft industry that becomes a noteworthy factor in current appraisals of future business. Reckonings hazard no guesses on the probable amount of buying to be done by the railroads, although this phase of the picture seems brighter than it has been for several years. Export trade is confidently expected to experience substantial growth with the steadily increasing ability of foreign users to acquire modern equipment for replacements and to enlarge their capacity by reason of increased business.

The tendency toward special high-production machinery and single-purpose tools has been most impressive during the past year than ever before, and it is among builders of such equipment that optimism over the new year is greatest.

INDIANAPOLIS

While sales during the past year of machinery and machine tools in this territory have not broken any records, the situation was far from discouraging. Some spottedness appeared at times during the year that kept down the volume, but during the last six months particularly, there was a resumption of demand that augurs well for the coming year.

Demand from automobile sources, including the factories themselves, the accessory manufacturers, of which there are many in this state, and the body plants, was good during the year. The accessory and body manufacturers particularly were in the market consistently, according to local machinery jobbers and manufacturers. And this demand is expected to continue unabated during the coming year.

The trade was not so encouraged over the iron and steel business, however. Some mergers occured in central Indiana during the year that rather livened business in this line, but on the whole demand from these industries was not as good as expected.

During the past year, there came into the market on a large scale a new user, namely the radio manufacturer. Here, and in a surprising volume, is a new user of special machinery and tools. In north Central Indiana there now are a number of factories building radios and many of them have been equipped during the year. Others, older, have added to their equipment. The cabinet factories, which had lagged in their demand for woodworking machinery for a couple of years, took on new life with the increasing sale of radios and the demand has been good for months. Here, too, the outlook for the coming year is very bright.

Demand from the electrical power field has been good and will continue good, but the interurban and railroad demand fell off decidedly at times. The railroads, it seemed, bought as little shop equipment as possible, and most of the interurban lines of the state did not have the money to make really needed repairs. Not much change is expected in this field during the year.

Demand from the coal fields, while almost nil in the shaft mines during the first part of the year, opened up somewhat during the last three months. Considerable heavy machinery in the shape of electric shovels and like equipment, has been sold to the strip mine interests and more will be sold during 1929.

CLEVELAND

The year 1928 was satisfactory to most dealers and agents in this territory. The volume done in some cases was exceptionally good and with some concerns exceeded last year's business by as high as 50 per cent. Consensus of opinion expressed by leaders in the machine tool field is that 1929 looks very favorable. The large accumulation of inquiries received during the last two months of the old year promises to develop into early sales during the first quarter of the new year.

The president of a company specializing in used tools stated that the past year was their best since the War. An increase of 200 per cent was noted during the last three months. Another dealer of a general line believes that the first six months of 1929 will show continued improvement. Those selling lines of automatic machinery are very optimistic for the future. One large producer made the statement that the past year was its best in the last eight years. It was also added that the automotive industry, aeronautical, and radio lines would be an important factor in next year's buying.

The treasurer of another automatic company made the following statement: "The automatic line for the past year has enjoyed its best business since war time. I can see nothing that might prevent the new year from being a good one. The general industrial condition is better at this time and seems to gain more momentum daily. We have on hand at the present time a large amount of unfilled orders. Foreign trade will show increased activity this year."

CINCINNATI

In summarizing their business for the past year, machine tool manufacturers of the Cincinnati district express satisfaction with their volume of sales and state that although the greater part of the orders were for single tools and replacements, the aggregate was considerably larger than in the previous twelve-month period. The forecast of some is that there will be an increased demand in the coming year, and there are none who do not feel that business will at least hold up to the past year's level.

Selling agents report a good volume of sales in the past year and state that they made a satisfactory gain. Basing their views on business pending and inquiries on hand, members of this branch of the trade forecast that sales in local and adjacent territory will be on an equally good level the coming year, or perhaps better.

Statements made by machine tool manufacturers as to the past year's business and as to the prospects for the coming year were in substance as follows:

"We made a substantial gain in the past year, comparing it to the previous one. The great majority of our orders

called for single tools, but these made up a good aggregate. In my opinion the demand will continue at about the same level during the coming year."

"In the past year we made a gain of about 25 per cent in sales, comparing it to the previous year. The greater portion of our business was made up of small orders, coming from all sections of the country. We regard the prospects for the coming year as being very good."

"Broadly speaking, the past year's business was very satisfactory. Individual orders were relatively small, but the volume of sales was greater than in the previous year. At this time the indications are that the demand will be equally good the coming year, or even better."

"We made a considerable gain over the previous year, sales being larger in the last half than in the first. Inquiries now coming in indicate that we will make a further gain in 1929."

"We made a gain of 30 per cent in the past year. Business pending indicates that 1929 will be still better. Some fairly large orders came from the automotive field, but the greater part of the volume was made of single orders from all sections of the country."

"We had a very good year, with a substantial increase in sales. The great majority of the orders were for single pieces of equipment and the orders were well scattered over the country."

"The past year has been very, very good, from a sales standpoint, and we made a gain of about 40 per cent, comparing it to the previous year. The large amount of business we have pending indicates that 1929 will be a good year."

"The past year was much better than the previous one. There has been a visible improvement in the market in the past three months, and we expect to make a further gain the coming year."

"We had a 50 per cent increase the past year. The greater part of the business was made up of small orders, well scattered over the country."

"Business was very good with us the past year, and the prospects for 1929 seem to be excellent."

"Our 1928 sales showed an increase of about 25 per cent over the previous year, and in my opinion business will be still better in 1929."

NEW ENGLAND

The year 1928 has been an inspiration to New England industry. From a business viewpoint it lived up to all promises and even over-reached the optimistic predictions voiced by leaders in the machine tool field last year. Probably this particular territory never experienced a more important nor more timely industrial activity. Undoubtedly in no previous presidential election year was there such a steady balance that characterized the machine tool industry throughout the entire year.

New England machinery builders are optimistic with very good reason. The year has left an encouraging outlook and created confidence. Almost without exceptions the past twelve months period gave companies improved business. A number of concerns have completed their best year since the War. Others have registered increased sales volumes from 15 to 40 per cent in excess of 1927 totals.

The year's upward trend, a marked feature of 1928, had its beginning during the last quarter of 1927. Last January developed a large prospective business, resulting in a fine volume of orders, many of which were for heavy-duty machine units. These orders increased steadily from month to month with only a slight lapse in midsummer to reach peak proportions during the fall months.

Without a doubt, the automotive industry furnished the source of the bulk of these orders. A survey of leading industrial cities discloses that from 40 to 70 per cent of industrial activity was due to the automobile industry. The electrical and aeronautical industries were also heavy buyers. Sales during the year were augmented by a steady demand for small machines. Sales of heavy production equipment were less conspicuous during the last half of the year, but declines in this field were more than made up by the strong sale of small machines.

During the year the aeronautical industry made more rapid strides in this section than ever before. Hundreds of New England cities and towns have appropriated money for or have already built airports. New airplane plants are being built, others are contemplated. In 1928 the Pratt & Whitney Aircraft Co. turned out its 1,000th airplane engine after three years of existance. Today the company is producing at the rate of 140 engines monthly and will shortly increase this capacity to 150 engines per month. It is an outstanding example of the growth of this industry.

The aviation industry is now an established New England institution. The year 1929 can be viewed more optimistically because of that fact: Machine tool officials are agreed on this point. It remains however more or less speculative when considered from the point of view of individual concerns. Future development should be rapid and subjected only to temporary setbacks. As an industry it has its parallels in other fast growing industries. Some danger lurks in over expansion and shifting markets. These remarks represent the views of manufacturing leaders, who feel the machine tool industry has much to look forward to from aeronautical sources.

The New Year finds full schedules and generally heavy order balances, and a fine display of optimism in the New England machinery industry. Increased buying throughout the year is expected from the aeronautical industry, as well as a good volume of business from the automotive field, and the electrical manufacturing field. A genuine improvement in railroad buying also is anticipated.

PHILADELPHIA

Machinery and machine tool dealers throughout the Philadelphia market look forward to 1929 with a feeling of optimism based upon what they regard as a sound economic situation. The promising future is particularly bright in the automotive field, and those engaged in machinery and mechanical equipment for general industrial lines also report a favorable situation.

There is nothing at this time to indicate the steam railroads will be in the market for extensive purchases during the coming year, but the inquiries from other lines have given rise to the optimistic feeling, and there are many indications that the manufacturers of machine tools themselves are preparing to modernize their equipment in preparation for additional business during the coming twelve months.

A summary of the business for 1928 shows that virtually all of the leaders in this market enjoyed the most prosperous year since the war time peak.

"Next year's outlook is very promising," said one dealer. "The inquiries which we have received contain a promising outlook for orders to be delivered early in January. We look to the coming year with much encouragement."

"There is a general disposition on the part of machine tool dealers to modernize their shop equipment and keep abreast of the progress in other lines," said another dealer. "The general industrial situation is on a sound basis, judging from the numerous requests we are getting for prices and a general line of inquiry which comes from a well scattered area."

"We do not like to make predictions, but while there are no big railroad lists out, the indications are that next year will witness much buying from general industrial lines and from the automotive industry," said another Philadelphia representative of a large manufacturer.

The last two weeks in the industry has been rather quiet, except for the placement of an order for wire automobile wheels with the Budd Wheel Co., the total order being for $2,500,000. It came from one of the large Detroit manufacturers, the name of which was not revealed.

For the most part buying of machine tools in this market during the past fortnight has been for replacements. Nothing of a large nature was reported, as most of the concerns that usually place orders are engaged in inventory and other year-end activities incident to a clean-up of the activities during the last two months.

CANADA

Business in the machinery and machine tool field in Canada last year was particularly good; in fact some firms state that it was the best year they have had since the post war period. The prosperity of Canadian business generally throughout 1928 was even more marked than in 1927. This prosperity was reflected both in absence of unemployment in manufacturing industries and in an almost phenomenal increase in activity in fundamental industries such as mining, pulp and paper and power. The railroads too were in the market for a greater amount of rolling stock and equipment, which was reflected in greater activity in the car building plants. This branch of the industry will undoubtedly prosper in 1929, as the railroads are preparing to place extensive orders for new equipment.

The year was a busy one for the implement manufacturer. Production was in good volume, labor was plentiful and efficient, and material prices showed little fluctuation. Keeping pace with the rapid growth of industry and coupled with the additional development of water power resources, the electrical manufacturing industry experienced a year of expansion and the outlook for the coming year in this line is very encouraging.

The iron and steel industry is in a better position than at the beginning of 1928. Throughout the year an improved demand for steel was experienced, largely due to the consumption of heavier tonnages for railway needs. Official figures on production for the first eleven months of 1928 show a cumulative output of pig iron 43 per cent over the corresponding period of 1927 and of steel 40 per cent in excess of the previous year.

It is the general consensus of opinion that the prospects for 1929 in the various branches of the metal-working industry are bright, and there appears to be no reason why most firms should not have a satisfactory increase over 1928. Demand for machine tools should be particularly good in view of the extensions which are to be made to many manufacturing plants throughout the country.

With the increasing growth of aeronautical activity in Canada, a new field for the output of equipment companies is being developed and orders are expected to be extensive in 1929.

BUFFALO

Without an exception, Buffalo machine tool dealers assert that when the final figures are totaled, it will be shown that 1928 was a better year than 1927. Several state that it is the best year of five years. It is also evident that the last half of the year was much better than the first half.

Practically the same may be said of the electrical supply manufacturers and dealers. The last half of the year was the best, although the ratio of business in this field was not so favorable in 1928 as that of the machine tool dealers. In the contractors' equipment field, business was but a shade better than that of 1927 with prices still unsettled, although some progress has been made toward stabilization.

The feeling is quite generally prevalent that 1929 will have some of the characteristics of a boom year, and even the most conservative assert unhesitatingly that the first six months will undoubtedly be as good and probably better than the last six months of 1928.

Manufacturers of equipment in this dis-

trict are also extremely pleased over the business for the year, the most conservative confessing to a 15 per cent increase in business in 1928 over that of 1927 and declaring that the first half of 1929 looks highly favorable. Several are expecting that 1929 will be a brilliantly successful year, and state that 1928 exceeded their best previous year.

NEW YORK

Machine tool dealers and factory representatives in New York have just passed through a remarkable year, the best since the War, without a doubt. Most dealers did a volume of business from 25 to 50 per cent greater than in 1927, and the gains registered by some factory representatives were even greater; in one case the year's quota had been trebled. With many unfilled orders on hand, with inquiry active, particularly on the part of concerns that have not bought equipment for some time, and with plenty of "irons in the fire," the machine tool trade is entering the new year with considerable optimism. The general consensus of opinion is that the next six months will be as active as the last.

In general, the buying of shop equipment has been well scattered and in small units. There were, of course, several outstanding purchases during the year that were shared in by a number of vendors. The year started off with what was probably the largest single outlay for machine equipment that has ever occured in this market when the Mergenthaler Linotype Co. revamped its plant in Brooklyn. During the early summer and again in the fall, the Wright Aeronautical Corporation bought equipment which amounted close to $1,000,000 in the aggregate, and purchases by the General Electric Co. for its radio and electric refrigerator manufacturing departments, while less spectacular, was a close competitor in total volume. Other firms that developed as important buyers in the last quarter were: R. Hoe & Co., the International Motor Co., and, for a limited number of sellers, E. W. Bliss Co. With the exception of the linotype concern, every one of these companies will no doubt figure in the market to a considerable extent in 1929. Purchases of equipment for the city subway shops, now under construction in uptown New York, will probably be another feature of the year also.

The wave of buying actually began in December, 1927, but little notice was taken of it until the summer, when the usual seasonal slump failed to materialize. Active buying continued right up to the election, and after that historic date the pace set by purchasers was even faster. December on the whole was a good month, and sales continued through the holidays. Little hesitation on the part of buyers to postpone purchases of needed equipment until after Jan. 1 was noted. One obvious reason for this condition is the fact that deliveries are becoming longer, the shortest time in some cases being 8 to 10 weeks. In fact, the delivery situation has become aggravated in the last quarter, and the question of delivery is now an important item in competition. Incidentally, some price changes in an upward direction are anticipated by some of the local dealers.

Most of the metal-working shops in the metropolitan district are busy, and apparently are taking advantage of their prosperity by modernizing their equipment.

Excerpts of remarks made by dealers and factory representatives should be of interest:

"We are entering the year with more unfilled orders and inquires on hand than at any similar period since 1913," said a leading dealer. "Sales in 1928 were about 25 per cent over those in 1927, despite the fact that our largest single order in history was credited to 1927 business. The bulk of orders received during 1928 were medium sized, the most active territory being New England."

"I exceeded my budget by 50 per cent," said a representative handling lathes, "and only two orders were for more than three machines. I expect to do even better in the new year."

"We did about 20 per cent more business in 1928 than in 1927," remarked another prominent dealer, "but except for three big orders, the year would have been about normal. We look to fair activity this coming quarter."

Another smaller dealer stated: "With an excellent December, we have done 50 per cent more business in 1928 than in the previous year, and look to increased activity in 1929 as our lines become better known."

"I trebled my year's quota and now have sufficient unfilled orders on hand for delivery in the next quarter to equal all of 1927 business," said a representative of a milling machine manufacturer. "About 60 per cent of the year's business was in large orders."

Another dealer remarked: "The past year was the best in our history, sales being about 25 per cent above those of 1927. Inquiry on hand and the number of deals pending indicate that the first six months of 1929 will be very active, compared with the same period last year. We find a better spirit of co-operation between buyers and dealers, particularly in the method of purchasing equipment. Most of our business was well scattered and will probably continue so."

A newer concern in the field had this to say: "The year's business exceeded our expectations, and with present leads it appears that two or three times as many orders should be received in the first six months as in the same period last year."

Two representatives, each handling turret lathes, found orders two to three times their budgeted sales.

Sales of heavy equipment, particularly to railroads, have been much below normal in the past year, however, according to several companies making such products. One company with offices in New York does not anticipate any great change in the situation, while another is looking forward to increased railroad orders in the new year. The past three years have been a period of retrenchment on the part of the roads, during which time there has been centralization of repairs with consequent more efficient use of shop equipment. By building special-purpose tools to meet the new conditions, this latter manufacturer believes a market will be found, particularly in view of the improved earnings of the roads in recent months.

Purchases of punching and shearing equipment by structural shops were about average for the past year.

It is interesting to note in this connection that sales of used and rebuilt machine tools of large size, on the other hand, have almost doubled as compared with those of 1927, in the case of a leading company handling this line.

SOUTHERN DISTRICT

It is the consensus of opinion among machinery, machine tool and mill supply distributors in Atlanta that while the volume of 1928 business established no records it was fair as a whole, particularly the latter part of the year except on one or two lines that were better the early part of the year, and that the outlook for 1929 business is generally good for most lines.

One well-known firm of machine tool dealers stated 1928 business had been fair, but that they did not consider the 1929 outlook very promising.

Another dealer who is exclusive representative in the Southeast for several well-known lines, stated that business for his lines was fairly good the early part of the year, but less brisk the latter part of the year save in the textile field. The outlook for 1929, he stated, seemed very promising, especially with the larger industrial corporations, mainly the textile and railroad industries.

The branch representative in Atlanta of a large Eastern textile machinery manufacturer stated the past year had been rather quiet except the last two or three months of the year, when there was a good volume of buying by the textile industries, with the outlook in this field unusually good for 1929. The primary reason business was a little slow earlier in the year was due to the fact that several New England plants moved to the South, this throwing a large amount of used equipment on the market. This tendency has been less prevalent the last three or four months, however, and it has naturally increased demand in this field for new equipment.

A representative of a firm making anti-friction bearings reported optimistically on business conditions, stating the branch had shown a fair gain in 1928 sales over 1927, and that present indications were for an increase in 1929 over 1928.

Another manufacturer's representative stated business had been generally satisfactory in the Southeast the past year, and that the 1929 outlook was more promising for most lines. The outlook is particularly good in the textile field, and promising in the road building field, mainly for stone crushing and quarry equipment with the possible exception of Georgia, North Carolina and South Carolina, where these industries were particularly good buyers in 1928 and are now fairly well equipped for the coming year.

In the woodworking machinery field the outlook was considered good for 1929 by one distributor of such equipment, with business rather spotty the past year, some months showing a gain over 1927, others a loss. Other woodworking distributors considered the 1929 outlook fairly promising, mainly in the furniture field. C. B. Harman, secretary-manager of the Southern Sash, Door & Millwork Manufacturers Association, said that while this industry did a good business in 1928 its equipment orders were not as heavy as in 1927, though the 1929 outlook was excellent if business held up, as many of the plants are replacing obsolete with new machinery.

Distributors of used and rebuilt equipment had about a normal or close to normal year in 1928, especially in the garage and small machine shop field, and look for normal or better than normal volume in 1929. William E. Dunn, Jr., secretary of the Southern Metal Trades Association, stated smaller machine shops were not active in 1928 and bought less, but that the outlook for 1929 seemed much more promising.

DETROIT

There is a general and a firm conviction in Detroit that the coming year will be at least as good and perhaps even better than 1928. Throughout the automobile industry, among the accessory and parts manufacturers, the machinery and machine tool trade, merchants, bankers and newspapermen, there is a note of optimism for 1929 that was not nearly so apparent at this time last year.

In general, the automobile manufacturers and dealers are convinced that more cars will be sold, or that at least as many will be sold in 1929 as in 1928. They point to the fact that the country at large is unusually prosperous and that it will probably be more prosperous under the administration of Herbert Hoover. Machinery men feel that as long as people are prosperous they will continue to buy cars and as long as they do that the machinery business will be good.

This argument is carried out all along the line. Men in all lines of endeavor here feel that the condition of Detroit is certain to be excellent as long as people in other parts of the country are in a position to buy new cars.

In the machine tool and the machinery trade there are some evidences already that next year will be a good one. Not only are orders beginning to come through, but there are numerous inquiries and many indications of one kind or another that business will be good.

The Aeronautical Industry Continues to Grow

Outstanding in the aeronautical news of the week was the announcement that the Sikorsky Aeronautical Corporation, of College Pt., N. Y., has purchased a 30-acre tract at Bridgeport, Conn., between the municipal airport and the Long Island Sound and will erect a large factory there. The building is to have 125,000 sq.ft. of floor space and will be ready for occupancy by May. The plant is to cost $450,000 and will eventually employ 1,600 men. All present activity at College Pt. will be transferred there. Igor Sikorsky, the designer, is planning to start work in a few months on a 24-passenger, 4-engine flying boat, the engines of which will develop 2,000 h.p. The company has been building amphibians in the last year. All sales are through the Curtis Flying Service, Inc.

The Curtis Aeroplane & Motor Co. of Buffalo, has asked building permits from town of Tonawanda, N. Y., to construct an $108,000 factory building and $125,000 office building. Both buildings are in addition to the $700,000 factory building now in the process of construction. These additional buildings will be located adjacent to the main factory building.

The Glenn L. Martin Co. has been incorporated in Maryland by Glenn L. Martin with a stock valuation of $3,000,000 to experiment with and develop airplanes. Warehouse space has been leased from the Canton Co., Baltimore, and operations are expected to begin in January. A statement from the company says that its entire business will be located in Baltimore, and that a new plant with all new equipment will be in operation in the spring.

The Wright Aeronautical Corporation has acquired the license to manufacture in the United States the "Gypsy" engine for light airplanes developed in England by the de Havilland Aircraft Co., Ltd., for use in Moth planes. The Gypsy is an air-cooled four-cylinder-in line type of power plant developing 85 100 hp. The Gypsy engine will not be manufactured at the Paterson plant, but instead a factory will be acquired in the Middle West for the especial production of this model in order that distribution may be facilitated. Production is to begin in May, the location of the new plant to be announced later.

The Pioneer Instrument Co., of Brooklyn, N. Y., maker of aeronautical instruments, is about to build a four-story addition to its plant at a cost of $110,000. The new structure will increase floor space for manufacturing equipment by about 50 per cent, besides affording increased office facilities.

Another step in the expansion program of the Travel Air Manufacturing C.o, Wichita, Kansas, was taken recently when the contract for the construction of an additional $50,000 unit was given to the Underhill Construction Co. The new unit will be 75x275 feet.

New England gains another airplane factory with the announcement that the Moth Airplane Corporation will locate its manufacturing operations in Lowell, Mass. Machinery for building parts of Moth planes is being installed in one of the buildings at the local airport. Plans call for the production of one plane a day.

Heald a Quarter Century in Worcester

The end of 1928 completes a quarter of a century that the Heald Machine Co. has been in Worcester, Mass. In 1903, J. N. Heald moved the plant from Barre, Mass., to the present location and has acted as general manager and treasurer ever since. At that time the shop measured 90x100 ft. and had 21 employees, while today it measures 200x600 ft. and employs 750 workers. Last year the Heald company bought out the grinding interests of the Giddings & Lewis Machine Tool Co., of Fond du Lac, Wis., thus concentrating the construction of automatic internal grinders.

Industrial Barometers Tell Their Story

Steel plants showed lessened activity during the week ended December 22, as compared with the preceding week, but were almost 20 per cent more active than a year ago, according to the weekly statement of the Department of Commerce. Prices for iron and steel showed no change over the previous week, but were higher than a year ago. A new sales record was made in copper and the price advanced ¼ cent to 16¼ cents per pound. Most of the sales were for March delivery.

The index of foundry equipment orders for November rose to 198 as compared with 185 in October and 170 in September. The low point this year was in July when the index figure stood at 95, and the high point, 278, occurred a month later.

November shipments of steel-furniture stock goods, as reported to the Department of Commerce by thirty-four manufacturers, totaled $2,856,569 as compared with $3,158,998 in October and $2,856,181 in November a year ago.

New orders for steel castings in November as reported to the Department of Commerce by the principal manufacturers, were 59 per cent of shop capacity as against 54 per cent in October and 43 per cent a year ago. The production of steel castings was 57 per cent of capacity in November as against 60 per cent in October and 41 per cent a year ago.

Business Items

The Spraco Painting Equipment Co., Somerville, Mass., maker of industrial finishing equipment, has merged with the Spray Engineering Co., of the same address, manufacturer of spray cooling equipment, under the name Spraco, Inc., with offices and factory facilities combined at 114 Central St., Somerville. Thomas W. Pelham, vice-president of the Gillette Safety Razor Co., is chairman of the board. Wayne B. Thompson is president of Spraco, Inc.; Frank G. Dennison, vice-president, and Wm. F. McDonald, treasurer.

Gears and Forgings, Inc., is now completing a three-story addition to its Cleveland plant which will give 20,000 sq.ft. more floor space for the production of speed reducers. Early in the year the manufacture of all reducers under 50 hp. in capacity will be shifted to this plant. The capacity for small and medium-sized gears will be increased also. Large reduction units of special design will be built at the Ford City (Pa.) plant of the corporation, as before.

Officials of the Newcastle (Ind.) plant of the Chrysler Motor Corporation have announced that an 80-ft. addition to the present forge room is under construction. The extension will contain 6,400 sq.ft. of floor space. Additional equipment to be installed includes two 6,000-lb. steam hammers, a 5,000-lb. upsetting machine, a new electric overhead crane and a 125-ton railway track scale. The hammers will weigh 90 tons each.

The Logansport Machine Co., Logansport, Ind., manufacturer of the "Logan" air-operated chucks and labor-saving devices, announces the purchase of the plant formerly occupied by the Logansport Furniture Co., into which the machine company plans to move as soon as remodeling is completed. The additional floor space obtained will enable the company to double its output. F. B. Wilkinson is president and F. G. Payson, general manager.

The Machine Products Co., East 179th St. and St. Clair Ave., Cleveland, has changed its name to the Ohio Gear Co., since the products of the concern for the past decade have been chiefly cut gears and splinned shafts, as well as speed reducers. No change in administration or personnel accompanies the change in name.

The industrial oil burning equipment made by the Gilbert & Barker Manufacturing Co., of Springeld, Mass., will be sold by M. K. Epstein, formerly manager of the company's industrial sales division. He is located in Springeld also.

The Kansas City plant of the Chevrolet Motor Co. began operations this week. It covers 32 acres, includes five buildings, and has a capacity for 350 cars a day.

Personals

EDWIN H. PEIRCE has resigned as vice-president and general manager of the Niles Tool Works Co. This is coincident with the merger of the Niles Tool Works Co., the Hooven, Owens, Rentschler Co. and the Hamilton Press Co., all of Hamilton, Ohio, to form the General Machinery Corporation. The Hooven-Owens company is the controlling interest in the merger and its present executives will operate these adjacent properties under unified management. Mr. Peirce will remain a director of the Niles Tool Works Co., formerly a division of the Niles-Bement-Pond Co. Previous to his association with the Niles Tool Works Co. Mr. Peirce was for nineteen years with the United States Steel Corporation as superintendent of the New Haven (Conn.) Works, and the South Works, at Worcester, Mass., of the American Steel and Wire Co. Mr. Peirce has made no announcement in regard to his future plans.

CLIFFORD W. HILL, who formerly represented the Thompson Electric Welding Co., of Lynn, Mass., in New England, will again handle sales for the company in the entire New England territory as direct factory representative, making his headquarters at Lynn. The Taylor Hall Welding Corporation, Worcester, which formerly handled this territory will cease to represent the Thompson company.

C. E. WILSON, retiring head of the Delco-Remy Corporation in Indiana, has returned to Anderson, the main offices of the plant after a hunting trip in Arkansas. He will spend most of his time in Anderson until he moves to New York to became assistant to Alfred P. Sloan, president of General Motors Corporation.

F. MARTIN BUCKINGHAM has been transferred from the Wallace Barnes Co., Bristol, Conn., to Hamilton, Ont., where he has already assumed duties as general manager of the Canadian branch of the firm, the Wallace Barnes Co., Ltd. A new addition to this plant has just been completed, giving practically triple the floor space and capacity.

HUGH W. RANKIN, formerly with the E. W. Bliss Co., of Brooklyn, will represent the Thompson Electric Welding Co., of Lynn, Mass., in Detroit and Michigan State. He will be located at Room 2-219 General Motors Bldg., Detroit.

EDWIN F. DALEY, formerly of the Morse Dry Dock Corporation, Brooklyn, is now vice-president and general manager of the Otis Engine Co., 130 Clinton St., Brooklyn, N. Y., manufacturer of small gasoline-engine-driven cranes.

C. M. GRANNIS, formerly with the mechanical department of the Lamson Co., Syracuse, has joined the sales organization of Crane-Schieffer-Owens, Inc., 510 Morgan Bldg., Buffalo, machine tool dealers.

N. H. SPENCER has been added to the Dallas (Tex.) sales force of the Wagner Electric Corporation, of St. Louis, Mo. For eight years he was with the Pittsburgh (Pa.) Transformer Company.

C. B. MCNAUGHT, president of the British Empire Steel Corporation, and A. A. HODGSON, of Montreal, have been elected directors of the Dominion Bridge Company.

WM. W. SWAYZE, formerly manager of the New Castle (Del.) plant of the American Manganese-Steel Co., is now superintendent of the Deemer Steel Casting Co., also of New Castle.

Obituaries

W. F. BAILEY, production manager for the Hoover Co., North Canton, Ohio, died Dec. 16, 1928, following an operation for appendicitis. Mr. Bailey had a high reputation for ability as an engineer and executive and was much in demand for articles and technical society papers on the problems of factory administration. He first showed in college the originality of mind that later brought him so much success. As a student at Lehigh University he declined to follow any one of the prescribed courses leading to an engineering degree but instead chose subjects that fitted in with the lifework he had selected. He stood high enough in his classes to earn election to the honorary fraternity of Tau Beta Pi and was prominent in athletics, but failed to get a degree because his scattered courses did not add up to enough points in any one department to meet the academic requirements. He came from the steel industry to the Hoover Co., where he had been for a number of years.

WINTHROP INGERSOLL, aged 63 years, president of the Ingersoll Milling Machine Co., died Dec. 19 in his home at Rockford, Ill., after less than a week's illness of pneumonia. The Ingersoll Milling Machine Company already was established when he transferred it in 1891 to Rockford, where it had since been located. He was donor of the Clayton C. Ingersoll Memorial park in Rockford and prominent in civic, social and athletic life of the community. He was long a figure in the machine tool business, having been a pioneer in the development of the planer-type miller and of the cutters designed especially for work found in both railroad and automotive shops.

HARRY D. PIERCE, aged 54 years, retired manufacturer and former president of the National Sewing Machine, Co., Belvidere, Ill., was drowned Dec. 17 at Palm Beach, Fla., where he had gone to recuperate from an illness. As a young man he became identified with the June Manufacturing Co. and when it merged with the Eldridge interests in the National Sewing Machine Co., he was made a member of the executive board. In 1925 became president. Ill health early this year forced his resignation.

R. J. LOCKHART, secretary-treasurer of the Gurney-Massey Co., Ltd., died at his home in Montreal, Que., on Dec. 21, after a short illness. Mr. Lockhart was born in Birmingham, England, 77 years ago, and moved to Montreal when quite young. At the time of his death he was looking forward to celebrating the 50th anniversary of his connection with the Gurney firm next April.

OLIVER W. HAYES, 43 years old, president of the Republic Motor Truck Co., Inc., died on Dec. 25 at Ann Arbor, Mich., of heart disease, which followed influenza. His home was in Alma, Mich.

Forthcoming Meetings

WESTERN METAL CONGRESS AND WESTERN STATES METAL & MACHINERY EXPOSITION. Held in Los Angeles, Jan. 14-18, under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Jan. 15-18, Book-Cadillac Hotel, Detroit. C. E. Haywood, in charge of meetings, 29 W. 39th St., New York City.

AMERICAN MANAGEMENT ASSOCIATION. Production Executives' conference, Feb. 27-28 and Mar. 1, at the William Penn Hotel, Pittsburgh, Pa. Oscar Grothe, vice-president in charge of the production executives' division, c/o White Sewing Machine Co., Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Regional meeting in Knoxville, Tenn., March 21-22, 1929. W. R. Woolrich, professor of mechanical engineering, University of Tennessee, Knoxville, in charge of program.

AMERICAN MANAGEMENT ASSOCIATION. Marketing Executives' Conference, April 3-4, at the Hotel Gibson, Cincinnati, Ohio. George R. Cain, vice-president in charge of the marketing Executives' division, American Management Association, 20 Vesey St., New York City.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Semi-annual meeting, July 1-4, 1929, in Salt Lake City, Utah. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

IRON stocks continue low with prices accordingly firm. Buying, however, continues in small volume. Scrap prices at Pittsburgh are at the highest point touced in twelve months. With underlying conditions in the raw materials sound, finished steel demand appears unusually brisk. Buying has been heaviest during the last year in structurals, pipe, tin plate, agricultural implement, railroad and automotive material. Non-ferrous materials showed no tendency to react from recent price firmness, during the week. Solder, however, declined ¼c. per lb. at New York warehouses.

(All prices as of Dec. 28, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.50@17.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.75) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.06@2.15	3.40	3.30	3.95*
No. 14	2.15@2.25	3.45	3.35	4.00*
No. 16	2.25@2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.55@2.65	3.60	3.40	4.00
No. 22	2.70@2.80	3.75	3.55	4.15
No. 24	2.75@2.85	3.80	3.60	4.20
No. 26	2.85@2.95	3.90	3.70	4.30
No. 28	3.00@3.10	4.50	3.85	4.45
Galvanized				
No. 10	2.70@2.80	3.95	3.75	4.25
Nos. 12 to 14	2.80@2.90	4.05	3.85	4.35
No. 16	2.90@3.00	4.15	3.95	4.45
No. 18	3.05@3.15	4.30	4.10	4.60
No. 20	3.20@3.30	4.45	4.30	4.75
No. 22	3.25@3.35	4.50	4.35	4.80
No. 24	3.50@3.60	4.65	4.45	4.95
No. 16	3.65@3.75	4.90	4.70	5.20
No. 28	3.90@4.00	5.15	4.95	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Glav.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

— Thickness — B.w.g. and Decimal Fractions		Outside Diameter in Inches—Price per Foot ⅛	¼	⅜	½	⅝	¾	⅞	1	1¼	1½
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23			
.049″	18	.17	.18	.19	.20	.21	.23	.25			
.065″	16	.19	.20	.21	.22	.23	.25	.27			
.083″	14	.20	.22	.23	.24	.25	.27	.29			
.095″	13	.21	.23	.25	.26	.27	.29	.31			
.109″	12	.22	.24	.26	.27	.28	.30	.32			
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33			
.134″	10	.24	.26	.28	.29	.30	.32	.34			

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	4.00†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16@½-in. thick. †250 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			16.75
Tin, Straits, pigs, New York			53.00
Lead, pigs, E. St. Louis	6.35	New York	8.00
Zinc, slabs, E. St. Louis	6.35	New York	8.00

	New York	Cleveland	Chicago
Antimony, slabs	12@13	12.75	14.25
Copper sheets, base	25.00	25.00	25.00
Copper wire, base	21.37½	21.25	17.87½*
Copper bars, base	23.50	23.50	24.00
Copper tubing, base	26.37½	26.37½	26.37½
Brass sheets, high, base	20.50	20.50	20.50
Brass tubing, high, base	25.37½	25.37½	25.37½
Brass rods, high, base	18.25	18.25	18.25
Brass wire, high, base	21.00	21.00	21.00

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	10.11
Solder (½ and ½)	34.75	35.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade			67.00
Commercial genuine, intermediate grade			53.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold rolled	53.00	40.00†
Tubing	75.00*	90.00
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	14.25 @14.37½	13.75	12.75 @13.25
Copper, heavy, and wire	13.00 @14.00	13.00	12.12½@12.50
Copper, light, and bottoms	11.75 @12.25	11.00	11.00 @11.50
Heavy lead	5.12½@ 5.37½	6.25	4.75 @ 5.25
Tea lead	3.50 @ 4.00	4.25	3.75 @ 4.25
Brass, heavy, yellow	7.75 @ 8.00	8.50	8.00 @ 8.50
Brass, heavy, red	10.50 @11.00	....	10.25 @10.75
Brass, light	6.25 @ 6.75	6.75	6.75 @ 7.25
No. 1 yellow rod turnings	8.75 @ 9.25	9.50	8.75 @ 9.25
Zinc	3.25 @ 3.75	3.25	3.00 @ 3.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†	.16@.16½	38.00 per M	.16
Sal soda, per lb.	.02	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.108	.11	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.30	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade	50%	50–10%	50%
Second grade	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales or less.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb.	.034	.034	.033
Brass rods	per lb.	.1825	.1825	.165
Solder (½ and ½)	per lb.	.3475	.3575	.3675
Cotton waste, white	per lb.	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia	per 100.	3.59	3.59	3.10
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.30	.30	.27
Belting, leather, medium	off list.	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs	off list.	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper	$4.05	$4.29	$4.29
Emery cloth	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper	2.04	2.04	2.04
Cloth	3.59	3.59	3.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville, 2.75@2.85		
Coke, prompt foundry, per net ton	Connellsville, 3.75@4.50		
White lead, dry or in oil	100 lb. kegs	New York, 13.25	
Red lead, dry	100 lb. kegs	New York, 13.25	
Red lead, in oil	100 lb. kegs	New York, 14.75	

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger, up to 1 x 30-in.	50%
1⅛ and 1¼ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square or hexagonal, blank or tapped, up to 1-in. incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb.	$3.50*
Rivets, button and cone head:	
Small, including 7/16-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

D. C., Washington—Post Office Dept.—will receive bids until Jan. 4 for a 20 in. swing upright drilling machine.

Mich., Detroit — Conn-Perry Mfg. Co., 4341 Horatio Ave. light metal manufacturers), screw machine and equipmen.

Mich., Detroit—Fisher Body Corp., General Motors Bldg., H. E. Beyster,—electric traveling cranes and equipment for proposed 1 and 3 story, 100 x 650 ft. automobile body plant on Beaubien St.

Mich., Detroit—S. T. Jessop Co., Inc., 2152 East Larned St., M. R. Head, Purch. Agt. (automobile accessories) — 14 in. lathe and 2¼ in. stroke punch press.

Tenn., Memphis — Murray Corp. of America, Clay Ave., Detroit, Mich.—woodworking machinery, etc., for proposed 1 story, 575 x 640 ft. automobile body plant here. Estimated cost $2,000,000.

Ont., Chatham—Bd. of Education—machinery and tools for machine and carpentry shops for proposed 2 or 3 story addition to school. Estimated cost $150,000.

Ont., Hespeler — Elrick Engine Co., U. Elrick Pres. and Gen. Mgr.—complete machinery and equipment for the manufacture of small steam and compressed air engines for recently acquired plant. Estimated cost $50,000.

Ont., Windsor—Bryant Pattern & Mfg. Co., 201 Glengarry Ave.—machinery and equipment for machine and woodworking shops, etc. for proposed 1 story, 85 x 90 ft. plant. Estimated cost $30,000.

Ont., Windsor—School Board—equipment for manual training department for proposed school on Tecumseh Rd. Estimated cost $350,000.

Opportunities for Future Business

Calif., Los Angeles—Moreland Aircraft Co., 5701 Boyle Ave., awarded contract for a 1 story, 80 x 200 ft. factory.

Conn., Hartford—I. Boyland. 112 Lafayette St., Stamford, will soon award contract for a 1 story, 50 x 142 ft. garage on Chapel St. Estimated cost $50,000. W. W. Dolliver, 2 Nepaug St., Archt.

Conn., Norwalk—W. R. Austin, Washington St. S., awarded contract for a 1 story, 60 x 250 ft. garage on West Ave. Estimated cost $125,000.

Conn., Waterford — Connecticut Power Co., 33 Union St., New London, awarded contract for a 3 story, 75 x 208 ft. service station here. Estimated cost $200,000. Noted Sept. 6.

Ill., Aurora—F. E. Davidson, 53 West Jackson Blvd., Chicago, Archt., will soon receive bids for the construction of a plant here for Independent Pneumatic Tool Co., 2600 West Jackson Blvd., Chicago. Estimated cost $40,000.

Ill., Chicago—General Electric Co., River Rd., Schenectady, N. Y., is having revised plans prepared for the construction of an 11 story plant at Ashland Ave. and Pershing Rd. here. Estimated cost $1,500,000. Graham, Anderson, Probst & White, 80 East Jackson St., Chicago, Archts.

Ill., Chicago — Stark-Line Furniture Corp., 4400 West 26th St., will build a 2 story addition to factory. Estimated cost $175,000. R. B. Kurzon, 105 West Monroe Ave., Archt.

Ind., Valparaiso — Fibroc Insulation Co. will soon receive bids for the construction of a factory, etc. Estimtaed cost $400,000. Lockhart & Felt, South Bend, Archts. Noted Dec. 13.

Ia., Council Bluffs—Kimball Bros. Co., C. Kimball, Pres., 9th St. and 11th Ave., manufacturers of passenger and freight elevators, awarded contract for a 2 story, 50 x 90 ft. foundry. Estimated cost $50,000.

Me., Biddeford—W. F. Mahoney, 62 Alfred St., awarded contract for a 1 story, 60 x 150 ft. repair and service garage at Elm and River Sts. Estimated cost $60,000. Noted Dec. 13.

Mass., Lynn—R. T. Pender, Inc., 41 Sutton St., awarded contract for a 1 story. 100 x 100 ft. repair and service garage at Liberty and Sutton Sts. Estimated cost $50,000.

Mass., Somerville (Boston P. O.)—E. M. Cremen, 10 Union Sq., is receiving bids for a 1 story, 150 x 160 ft. repair and service garage at 113 Central St. Estimated cost $50,000. Private plans. Noted Dec. 13.

Mass., Wellesley—Diehl & Putnam, 165 Linden St., is receiving bids for a 1 story, 112 x 145 ft. repair and service garage on Linden St. Brainard & Taylor, 89 Franklin St., Boston, Archts.

Mich., Detroit—Midland Steel Products Co., E. J. Kulas, Pres., West 106th St. and Madison Ave., Cleveland, O., awarded contract for a 1 story, 80 x 120 ft. laboratory here. Estimated cost $100,000.

Minn., Minneapolis — Federal Sign Co., 1215 Nicollet Ave., is receiving bids for a 2 story factory at 30th St. and University Ave. S. E. Estimated cost $30,000. Larson & McLaren, 308 Baker Bldg., Archts.

Minn., Minneapolis—Russell-Grader Mfg. Co., 2037 University Ave. S. E., manufacturers of road building machinery, awarded contract for a 1 story, 74 x 330 ft. addition to plant. Estimated cost $50,000.

Minn., St. Cloud — Granite City Iron Works awarded contract for a 1 story, 20 x 50 ft. addition to foundry. Private plans.

Mont., Butte — Butte Motor Truck Co., 120 South Montana St., plans the construction of a 1 story sales and service garage. Estimated cost $50,000.

N. H., Nashua—H. C. Lintott, 25 Main St., awarded contract for a 1 story addition to repair and service garage on Main St. Estimated cost $40,000.

N. J., Maplewood—Kroydon Co., Burnett Ave., will soon receive bids for a 1 story, 30 x 150 ft. factory for the manufacture of golf clubs on Burnett Ave. Estimated cost $40,000. D. A. Hopper, 22 Ridgewood Ave., Irvington, Archt. Noted Dec. 27.

N. J., aPterson—U. S. Piston Ring Co., 1222 South Grove St., Irvington, will receive bids in January for a 2 story plant at Iowa and Pennsylvania Aves., here. Estimated cost $50,000. Private plans.

N. Y., Brooklyn—S. Bier, 980 49th St., plans the construction of a 1 story, 100 x 200 ft. garage at Fulton St. and Hopkinson Ave. Estimated cost $50,000. C. Goodman, 375 Fulton St., Archt.

N. Y., Brooklyn — Braunweiss Realty Corp., 435 Beach 36th St., Edgemere, will build a garage at East 98th St. and Kingshighway. H. J. Nurick, 44 Court St., Archt.

N. Y., Brooklyn—A. D. Denis, 551 Sea Beach Rd., is receiving bids for a garage and repair shop. Estimated cost $40,000. A. Goldberg, 164 Montague St., Archt. Noted Dec. 20.

N. Y., Brooklyn — A. Goldberg, 164 Montague St., Archt., will receive bids for the construction of a shop, service station, etc., at 1026 Atlantic Ave., for S. G. Tilden, Inc., 3036 Northern Blvd., Long Island City. Estimated cost $40,000.

N. Y., Brooklyn—J. M. Horan, 119-11 196th St., St. Albans, plans the construction of a garage at Gates and Bushwick Aves. H. M. Sushan, 367 Fulton St., Archt.

N. Y., Brooklyn—Mason Waterproofing Co., 307 Herkimer St., plans the construction of a 2 story, 100 x 240 ft. garage at Herkimer St. and East Brooklyn Ave. Estimated cost $50,000. W. F. Doyle, 11 John St., New York, Archt.

N. Y., Brooklyn—National Foundry Co. of New York, M. G. Niman, Pres., 10 Sanford St., plans a 60 x 218 ft. foundry at Walworth St. and Flushing Ave. Estimated cost $50,000. Laspia & Samenfeld, 269 Broadway, Archts.

N. Y., Brooklyn—Para Realty Corp., L. Rauchelson, Pres., 191 East 39th St., awarded contract for a 1 story, 100 x 100 ft. garage at Glenmore Ave. and Barbey St. Estimated cost $40,000. Noted Dec. 20.

N. Y., Brooklyn — Polblum Corp., I. Polivnich, Pres., 26 Court St., will build a garage at Dean St. and Troy Ave. Estimated cost $40,000. E. M. Adelsohn, 26 Court St., archt. Noted Dec. 20.

N. Y., New York—Golmar Realty Co., E. Moran, Pres., 135 Broadway, will build a garage at 184th St., Granite Pl. and Webster Ave. Estimated cost $175,000. W. F. Doyle, 11 John St., archt.

N. Y., New York—Goodname Realty Corp., J. D. Goodman, Pres., 67 West 125th St., will build a garage at Sedgwick Ave. and 169th St. Estimated cost $75,000. H. Blumberg, 25 West 43rd St., archt.

N. Y., New York—J. McGinnis, 305 East Kingsbridge Rd., plans the construction of a 2 story, 88 x 101 ft. garage at Westchester and Waters Aves. Estimated cost $40,000. J. P. Boyland, 305 Kingsbridge Rd., Archt.

N. Y., New York—R. S. C. Realty Corp., C. J. Joser, Pres., 471 Park Ave., plans the construction of a 2 story, 125 x 131 ft. garage at Westchester Ave. and East Pugsley St. Estimated cost $40,000. Cohn & Siegel, 45 West 57th St., Archt.

N. Y., New York—M. Sender, 1830 Vineyard Pl., will build a garage at 176th St. and Vineyard Pl. H. M. Sushan, 367 Fulton St., archt.

N. D., Fargo—Northern Reo Co., R. Thorne, Gen. Mgr., 502 Northern Pacific Ave., awarded contract for a 2 story, 72 x 102 ft. sales and service garage at Front Ave. and 4th St. Estimated cost $50,000. Noted Aug. 30.

O., Cleveland—Murray Ohio Mfg. Co., C. W. Hannon, Pres., 1115 East 152nd St., awarded contract for a 2 story, 64 x 239 ft. stamping plant. Estimated cost $250,000. Noted Dec. 20.

R. I., Providence—Cadillac Providence Co., 9 Federal St., will receive bids until Jan. 4 for a 2 story service station, etc. on Broadway. Estimated cost $200,000. A. Kahn, Marquette Bldg., Detroit, Mich., archt.

Tex., Point Isabel—Republican Mining & Metal Co., Ltd., C. L. Bradbury, mgr., San Luis Potosi, Mexico, has acquired a site and plans the construction of a 2 story smelter plant here. Estimated cost $100,000. Private plans.

Wis., Chippewa Falls—E. J. Hancock, Eau Claire, archt., will receive bids until Jan. 9 for a 1 story, 64 x 91 ft. shop here for Chippewa Co.

Wis., Ladysmith—Elmberg Co., awarded contract for a 1 story, 127 x 200 and 34 x 90 ft. factory for the manufacture of toys.

Wis., Wausau—Ford Garage, P. J. Portman, prop., awarded contract for a 1 story, 112 x 112 ft. garage at Forest Ave. and 4th St. Estimated cost $40,000. R. W. Dwyer, 187 27th St., Milwaukee, archt.